VOLUME 37
NUMBER 9

SEPTEMBER, 1950

plating

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ZINC—BASE DIECASTINGS

See Contents Page 931

STOP SWELTERING

CAN YOU ? Bright Nickel and Chrome Plate Brass and Bronze Castings.

ON SAME RACK.

IF NOT, send for a copy of our new 1950 CLEPO compound catalog. On page 14 full details are given for Bright Nickel and Chrome plating Brass and Bronze Castings on same rack. The procedure involved includes the use of specialized Cleaning Cycles and specialized CLEPO Cleaning Compounds no copper striking application is necessary unless the work is soldered.

AND CHROME PLATING ON SAME RACK

OPERATION NUMBER	CYCLE 19	CYCLE 20
1	Soak Clean	Soak Clean
2	Water Rinse	Water Rinse
3	Anodic Clean	Spray Clean
4	Water Rinse	Water Rinse
5	Acid Dip	Anodic Clean
6	Water Rinse	Water Rinse
7	Bright Nickel	Acid Dip
8	Water Rinse	Water Rinse
9	Chrome Plate	Bright Nickel
10	Water Rinse	Water Rinse
11	Alkali Neutralize	Chrome Plate
12	Water Rinse	Water Rinse
13	Hot Rinse	Alkali Neutralize
14		Water Rinse
15		Hot Rinse

Note: These cycles can also be used on wrought [illegible]

A request on your Company Letterhead will bring a copy of the 1950 Clepo Cleaning catalog to you immediately.

CLEPO CLEANING COMPOUNDS

FREDERICK GUMM Chemical Company Inc.

538 FOREST STREET KEARNY N. J.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 900.

Ve ations

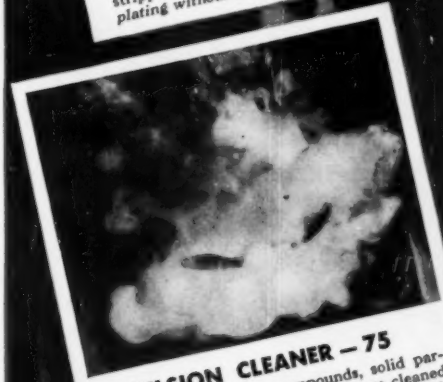
AL FINISHING . . .

METAL STRIPPER — A

An outstanding development for stripping defective electroplated nickel, copper, silver, cadmium and zinc from steel. Fast action . . . no basis metal attack. The highly polished grill cover illustrated has been completely stripped of nickelplate, and is ready for re-plating *without repolishing.*

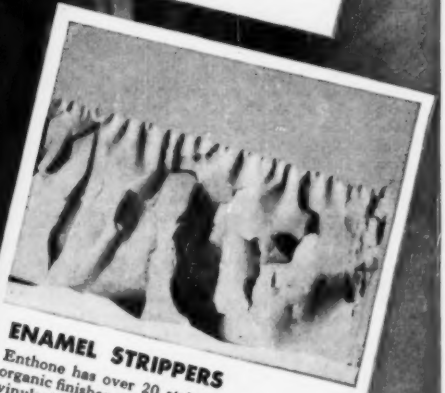
EBONOL BLACKENING PROCESSES

Ebonol finishes are used to beautify a widely diversified list of superior quality products. Photo shows steel parts blackened with Ebonol-S and S-30; copper and brass with Ebonol-C; zinc with Ebonol-Z. U. S. Patents — 2,364,993, 2,460,896, 2,460,898.



EMULSION CLEANER — 75

Oils, greases, buffing compounds, solid particles, deep seated in steel parts are cleaned out and completely removed by this emulsification process. Stubborn, gummy substances on die castings, milling machines, floors, motor blocks emulsify and disperse in water instantly.



ENAMEL STRIPPERS

Enthone has over 20 strippers for removing organic finishes — synthetic enamels, lacquers, vinyls, japans. The best strippers, tailor-made for your particular problem, are selected by laboratory technicians after test runs. This service is rendered free of charge.

FREE: Beautiful [illegible] with step by step instructions for [illegible] Enthone Products will appear [illegible] tion upon request.

Enthone Incorporated

[illegible] ELM STREET [illegible]

IMPROVED

and superior by every standard of comparison . . . and costs less!

MICCROSOL

E-1003

HEAT-CURED RACK COATING

● Now, the Michigan Chrome and Chemical Company laboratories have improved their single-dip heat-cured rack coating which offers, in addition to positive insulation and protection: (1) amazing tensile strength and scuff resistance; (2) permanent flexibility; (3) positive and continuous adhesion; (4) simplicity of application; (5) savings in time, labor, and material . . . a major objective of chemical engineers for years.

● Exhaustive tests reveal the marked superiority of Improved MICCROSOL E-1003 in every important manner of comparison. In addition to the outstanding characteristics listed above, tests for abrasion and resistance to all commonly used plating solutions, acids, and caustics show superior performance in comparison to similar products.

● Improved MICCROSOL E-1003 is a 100% solids non-evaporating material that produces a smooth, tough, leather-like coating with a single application which will often outlast the life of the rack. Racks are completely processed and ready for use in approximately 2 to 4 hours.

● Has exceptionally high gloss, allowing free drainage and no solution carry-over.

● If you are not prepared to coat your racks, write us and we will be glad to furnish the name of the applicator nearest you who is equipped to apply Improved MICCROSOL E-1003 Heat-Cured Rack Coating.

It's Improved in Every Respect!

Write for detailed bulletin.

MICHIGAN CHROME
and Chemical Company
6351 East Jefferson Avenue • Detroit 7, Michigan

MICCRO Products

Developed and Manufactured by

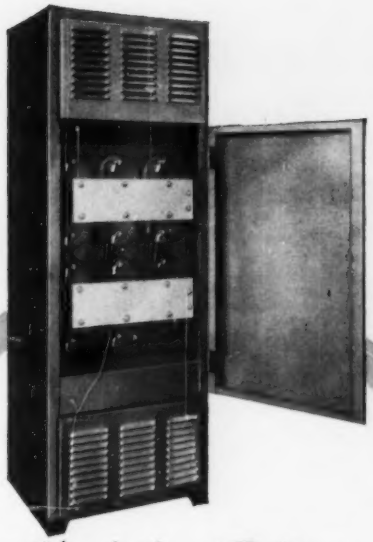
NEW

PLATING RECTIFIER

Protected from corrosive atmosphere

The first plating rectifier with oil-immersed selenium stacks

Put this new plating rectifier right where you need it—next to your plating tank. Get the money-saving advantage of tank-side location—low electrical losses of short connections—and still get full life expectancy from your rectifier. Only General Electric offers you such a rectifier. For only General Electric has an oil-immersed selenium rectifier stack designed specifically for plating work.



Check these Features

Oil-immersed Selenium Stacks—These rectifier stacks are hermetically sealed in welded, oil-filled cans. They are completely protected from plating-room atmosphere.

Ventilation—Fan blows downward over rectifier stacks and transformer. Air flow is not disrupted when inspection door is open.

Overload Capacity—Improved ventilation and thermal capacity of the large mass of oil in intimate contact with entire rectifier cell surface means this rectifier can safely handle short-time current overloads. It's ideal for barrel plating.

Dual Output Rating—By a simple bus-bar connection, you can obtain either 6 volts–1500 amps or 12 volts–750 amps from the same rectifier.

Dual Input Rating—This unit can be connected to operate from 230 volt circuits or from 460 volts. Taps are provided to correct for line-voltage variations.

Casing Design—Steel baffles protect operator from high-voltage connections when inspection door is open. To complete the corrosion resistance of this unit, all casing parts are phosphatized, then sprayed with an attractive hammertone finish.

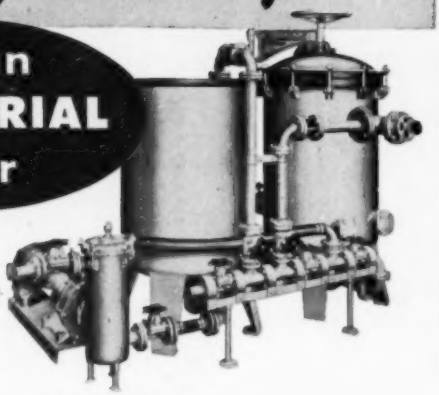
Get the complete details.
Write Section 464-4. Apparatus Dept., General Electric Co., Schenectady 5, N. Y.

GENERAL ELECTRIC

464-4

For Any Plating Solution *Any Quantity*

use an **INDUSTRIAL Filter**



100 to 15,000 gallons per hour. Portable and stationary models. Standard or special filtration systems engineered to meet unusual requirements.

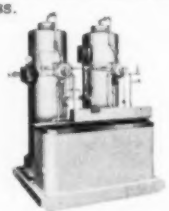
You save many ways . . .

Here's how Industrial filters keep down the cost of plating jobs—The flow rates of Industrial filters are based on the actual plating solutions involved. You know the capacity you get. In the filtration of plating solutions there is more than just the filter. With Industrial you get an adequate filter with slurry tank, motor driven pump, valves and fittings in a complete package with one, undivided, experienced responsibility—with space requirements at a minimum.

The labor, down time, and the inconveniences of cleaning, replacing the filter media, and reassembling the filter for every new filter cycle—all are eliminated by the Industrial Air-Wash Cleaning Method available for all models. It is necessary to remove the cover only when new filter cloths are installed. With Industrial filters, a clarified plating solution is always assured.

The engineering, design, and construction of Industrial filters have proved out in long service and low maintenance costs. Industrial has the experience and is large enough to handle your filter requirements. Since 1927 filters and filtration systems have been an important part of our business.

INDUSTRIAL Water Demineralizers



A Two-Bed INDUSTRIAL Water Demineralizer. Standard two-and four-bed units available with capacities of 200 to 1000 gph. Special units of any capacity engineered to requirements.

for **No stains after hot rinse. No unwanted precipitates in solutions.**

Write for full information and recommendations

FILTERS Pressure Type · PUMPS Centrifugal · CORROSION TESTING APPARATUS Salt Fog • Humidity

INDUSTRIAL FILTER & PUMP MFG. CO.

5914 Ogden Ave.
Chicago 50, Illinois

RUBBER DIVISION Vulcanized Linings • Molded Products · WATER DEMINERALIZERS

Industry News

Henry Levine & Son, Inc., electroplating consultants, has moved its office and laboratory from Forest Hills to larger quarters in the Jackson Building, 153 E. 26th Street, New York City, telephone Murray Hill 5-9427.

Industrial Filter & Pump Manufacturing Company has moved its general offices and plant from 1621 W. Carroll Avenue to a newly acquired location at 5900 Ogden Avenue, Chicago 50, Ill. The

much larger manufacturing space provides facilities to meet the increasing demand for the company's filters, demineralizers, heat exchangers, salt-spray-test cabinets, unit spray washers, vulcanized linings, and molded-rubber products.

The Instrument Society of America has just ordered and will mail out 250,000 invitations and preliminary programs announcing the Fifth National Instrument Conference and Exhibit to be held in the Buffalo Memorial Auditorium, September 18–22.

This gathering, sponsored by the Instrument Society of America, will include the American Institute of Physics, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, the Institute of Radio Engineers, and the Scientific Apparatus Makers Association. An attendance of over 10,000 is expected. Speakers will include more than forty outstanding scientists and technical specialists from Government, educational and industrial organizations.

Electroplating on Color Television. On July 13, Dr. Abner Brenner, of the Electrodeposition Section of the National Bureau of Standards, presented a popular talk about electroplating on a color-television broadcast of NBC from Washington, D. C. The principles of electroplating were illustrated by simple experiments, and the applications to various household and everyday equipment were shown by specimens. This is probably the first presentation of electroplating on

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If you want results like this...

use

DIVERSEY No. 909

Unique Heavy Duty Soak Tank Cleaner

WITH

DIVERSEY No. 12

Reverse Current Electrocleaner

Tubular Steel Furniture—Case History

PROBLEM: To clean polished steel tubular furniture prior to bright nickel and chromium electroplating.

FORMER PROCESS: Included mineral spirits soak, handwipe, spray wash, alkaline soak and two electrocleaning operations. Six men, working steadily, were required.

PRESENT PROCESS: Includes Diversey No. 909 soak, Diversey No. 14 spray wash, and Diversey No. 12 reverse current electroclean.

RESULTS: The Diversey Process completely removes oil and grease from the inside of the tubes avoiding contamination of pickle and nickel tanks as characterized the previous process. The cleaner tanks now are dumped every two weeks rather than every week as was formerly necessary. The No. 909 and No. 12 are the only materials this leading finishing plant has found that would eliminate the solvent and handwipe operations. The elimination of handwiping labor costs results in an estimated savings of $15,000.00 per year. A definite improvement in smoothness and luster of the electrodeposit resulted with Diversey No. 909.

MAIL THIS COUPON FOR COMPLETE INFORMATION

THE DIVERSEY CORPORATION
Metal Industries Department
1820 Roscoe Street • Chicago 13, Illinois
In Canada: **The Diversey Corporation (Canada) Limited**
100 Adelaide Street West, Toronto, Ontario

THE DIVERSEY CORPORATION
Metal Industries Department
1820 Roscoe Street, Chicago 13, Illinois

Gentlemen:
Please send me complete information on Diversey No. 909 and No. 12, including New Bulletins.

Name_____ Title_____

Company_____

Address_____

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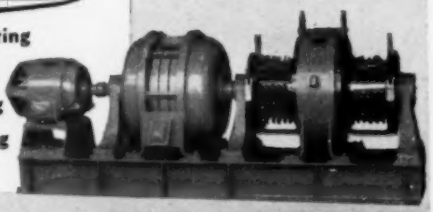
D-5-5

Motor Generators
by
COLUMBIA

For Electroplating
Anodizing
Electrocleaning
Electropolishing

There's a Columbia M-G Set available for your needs, whether you have a small plating bath or a large continuous strip plating line. Capacities up to 20,000 Amperes; 6 Volts and up. Dependable, performance proved, for many years. Your inquiries solicited.



COLUMBIA ELECTRIC MFG. CO.
4533 HAMILTON AVE. CLEVELAND 14, OHIO
Write for Catalog PL-700

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In BURNISHING MATERIALS

THE "PIN" HAS ITS POINTS

Pin-point probing into sharp crevices, filigree, small recesses and other hard-to-reach spots is the special burnishing function of Abbott Burnishing Pins. They're pointed to do the job right!

Abbott Burnishing Materials, available in five shapes . . . Ball, Ovalball, Cone, Diagonal, Pin . . . are scientifically designed to make effective contact on metal stampings or castings of any size and shape. Each piece is a burnishing tool made from Abbott's high quality bearing ball steel. Each is deep hardened and polished to a mirrorlike glass-hard finish. Make it a *point* to get better burnishing results in tight corners . . . use Abbott!

Abbott Burnishing Materials are available in a variety of sizes and mixtures. Send for complete catalog. No obligation.

THE ABBOTT BALL COMPANY
1054 New Britain Ave.,
Hartford 10, Conn.

ABBOTT
the all round ball

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Industry News

color television. This broadcast was received in black and white on regular sets, as well as in color on special "monitor" sets in the Washington area. This presentation was one of a series sponsored by the National Bureau of Standards as a contribution to the development of color television.

The completed main building of the General Electric Research Laboratory's new home at the Knolls, near Schnectady, is shown at left in this recent aerial photograph. With additional shop area, in the right background, it adds 85,000 square feet of usable floor space to the 74,000 in the original wing, to the right, which was completed in the fall of 1948. The row of black spots along the roof of the furthest section of the new wing are exhaust pipes from hoods in the chemical laboratories below, to carry away noxious fumes

National Association of Metal Finishers held a meeting on June 12 at the Statler Hotel, Boston, Mass., during the Convention of the American Electroplaters' Society.

New officers elected for the coming year were:

President—W. O. Zinn, Chicago, Ill.
First Vice-President—W. F. Walton, Attleboro, Mass.
Second Vice-President—D. J. Griffin, Birmingham, Ala.
Third Vice-President—R. W. Timberlake, Kansas City, Mo.
Treasurer—A. Betteley, Detroit, Mich.

A Secretary's and Treasurer's report was presented by R. A. Shack, Executive Secretary. He told of an extended trip, in part financed by the American Electroplaters' Society, during which he was able to start a number of local associations with excellent prospects for larger membership. The Association's finances, although still a problem, are steadily improving.

Members of the Masters' Electroplating Association of New York elected to the Board of Directors of the National Association for the coming year are Julian Nelkin and Frank Kaiser.

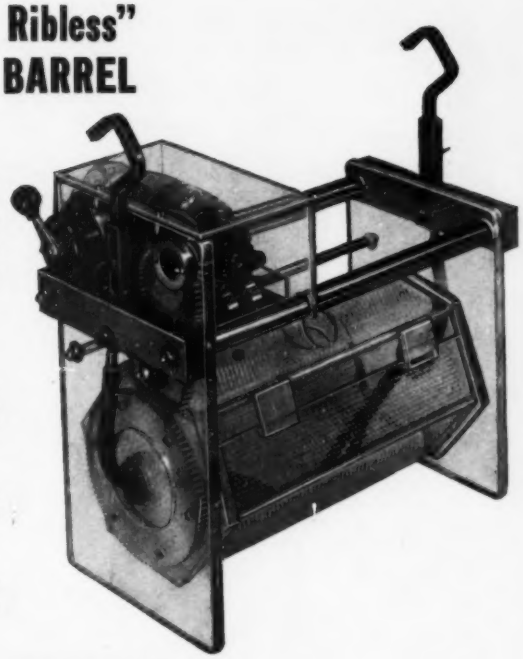
Rapid Electric Company moved early in August to 2881 Middletown Road, Bronx 61, N. Y., a plant specially designed and built for the manufacture of

Stutz

Creators of the first plating barrel to withstand the complete plating cycle—

presents

The New 1950 "Lucite Ribless" PORTABLE PLATING BARREL



The best looking. The best mechanically. The best in production. The best from any way you look at it. Revolves through the entire plating cycle without transfer of load from one cylinder to another. Made in Two Sizes:

6" x 12".....$185.00
8" x 18".....$275.00

with reversing switch and plug-in cord and with standard perforations of 3/32" or larger.

Small perforations $7.50 to $15.00 extra. As Lucite is non-absorbent, one unit can be used for all your solutions.

Order today—this is the best investment you can make for your plating room.

STUTZ

Your Guarantee of Quality!

GEORGE A. STUTZ MFG. CO.

PEERLESS PRODUCTS

1645 CARROLL AVENUE CHICAGO 12, ILL.

Plating anodes should—must—go into solution uniformly, if an economical, high quality deposit is to be obtained.

That ANACONDA Anodes do so is graphically demonstrated by this photograph. It shows ANACONDA Copper Anodes new and after 24, 36, 48 and 50 hours. Note the smooth surfaces.

Furthermore, ANACONDA Anodes reduce slime to a minimum and scrap losses are exceptionally low.

ANACONDA Anodes are supplied in copper, brass and bronze—rolled sheet or oval; in standard sizes or to your specifications; with or without hooks. Also copper "cathode-anodes." Publication C-5 will tell you more. Write for it to The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.

For plating with Copper, Brass or Bronze

USE ANACONDA® ANODES

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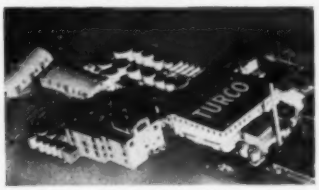
Industry News

selenium rectifiers and periodic reversing units. At the new location, three times as large as the present shop, expanded engineering, research and manufacturing departments will be installed. The new facilities will allow normal delivery schedules with greatly increased volume of business.

Copper Anodes from Stock in Middle West. The Hanson-Van Winkle-Munning Company, Matawan, N. J., announces that arrangements have been completed for its Anderson, Ind., plant to fabricate rolled copper anodes. Shipments can be made from stock in any reasonable quantity and size anode, assuring immediate delivery.

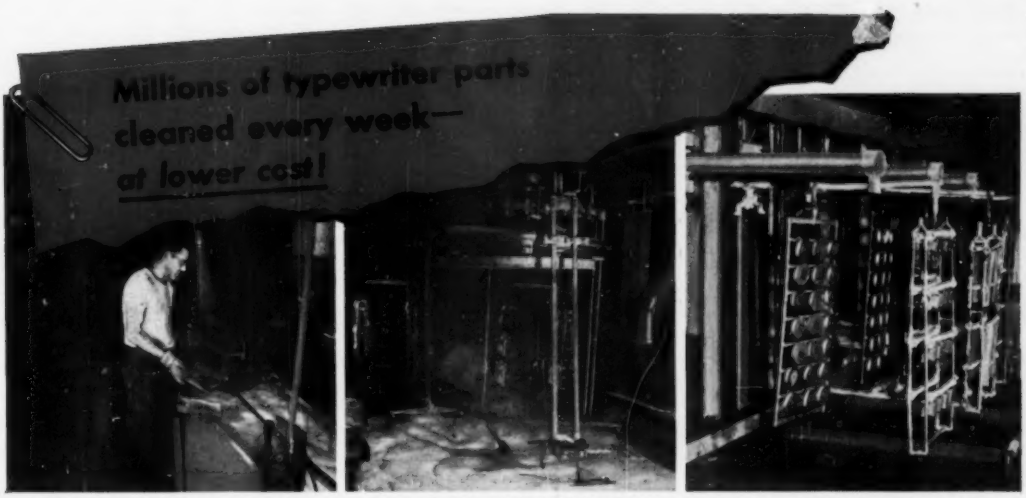
Turco Products, Inc., Los Angeles, Calif., manufacturer of industrial cleaning compounds, has acquired a large eastern plant located at 120 Lister Avenue, Newark, N. J., which will serve as a manufacturing and laboratory center for Turco's Atlantic Division.



Present manufacturing facilities will be approximately doubled by the use of the six major buildings covering 58,000 square feet and by the 950,000-gallon storage capacity on the new three-acre site. Ideally located adjacent to the Pulaski Skyway and the main line of the Pennsylvania, the new factory has an in-the-plant spur line connecting to all major rail facilities, as well as complete dock and lighterage facilities on the Passiac River.

Sidney E. Smith of Los Angeles has been appointed General Manager and N. B. Williford, previously head of Turco's Texas factory, Production Superintendent. Thomas Franzreb, Process Engineer, formerly of Philadelphia, is forming and will head a process engineering group headquartered at Newark. The production-control section will be headed by John Adamzevich of Los Angeles.

Joint Meeting of the Electrodepositors' Technical Society and the Dutch Electroplaters' Society in Holland. The Dutch Electroplaters' Society, or Studiekring Galvanotechniek, is a group formed recently by the Bond voor Materialenkennis Kring Metalen to meet the growing need in Holland, where very considerable and rapid development has taken place in the field of metal finishing since the last war. The impetus for this



Hand-line cleaning of small parts prior to plating at Remington Rand. Reverse electroclean operation uses Pennsalt 45-X at 8 oz./gal., 200°F., 5 to 10 minutes.

Remington Rand Automatic Black Nickel line. Reverse electroclean with Pennsalt 45-X at 8 oz./gal., 200°F., 3 minutes. Followed by rinse and reverse electro lean with Pennsalt K-2 at 8 oz./gal., 2 minutes.

One of two Automatic Semi-Bright Nickel Lines. After two electrocleanings—in baths of Pennsalt 45-X and Pennsalt K-2—the parts enter the plating tanks chemically clean.

How *Remington Rand* gets round-the-clock high production with PENNSALT CLEANERS

More than a million pieces a day—from tiny washers and screws to essential type bars and braces—go through Remington Rand's cleaning and plating lines at their Elmira, N. Y., plant. No doubt about it, this is a high capacity line—operating 24 hours a day. So the cleaner *has* to be good. A breakdown in cleaning could stall production in the entire plant!

For over five years, Pennsalt Cleaners have been used by Remington Rand—were chosen after tests proved they would give this dependable performance at lower cost than former methods. Here's the *two-way economy* these cleaners give Remington Rand:

1. Pennsalt Cleaners are concentrated—contain virtually 100% active ingredients; a minimum of cleaning compound is needed.

2. Pennsalt Cleaners have long life—frequent dumping of large process tanks is unnecessary. At Remington Rand, for instance, tanks are dumped just once a week (running 24 hours a day, this is equivalent to *three weeks* in the average one-shift plant).

As a bonus benefit of using Pennsalt Cleaners, Remington Rand reports that the local Pennsalt Technical Service man has been "very helpful—always available for consultation."

If you have special metal cleaning problems—or if you'd like to know how you may cut costs on your present cleaning operations—it will pay you to consult your Pennsalt Technical Service man. Contact him direct, or write: Special Chemicals Department, Pennsylvania Salt Manufacturing Company, Philadelphia 7, Pa.

The finished product—ready for your secretary!

There's a Pennsalt Cleaner for every metal cleaning operation

PENN SALT

PROGRESSIVE CHEMISTRY FOR A CENTURY

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 911.

movement has come from a number of technicians, the majority of whom are old members of the E. T. S.

The joint meeting will take place at The Hague (Scheveningen) September 27–30. The program includes two technical sessions at which papers will be presented by Dutch and British authors, and there will be an interesting round of social engagements.

The Fourteenth Annual National Time, Motion, and Management Clinic, sponsored by the Research Division of the Industrial Management Society, 35 E. Wacker Drive, Chicago 1, Ill., will be held in the Sheraton Hotel, 505 N. Michigan Avenue, Chicago, on November 2-3. General Chairman of the clinic is Ralph H. Landes, Western Electric Company. Program Chairman is William S. Wheeler, McGraw-Hill Publishing Company.

The Hot-Lacquer Process, covered by U. S. Patent No. 2,150,096, has been dedicated to the lacquer industry by Commercial Solvents Corporation, 17 East 42nd Street, New York 17, N. Y., retroactive to January 1, 1950. This process is said to be adapted profitably in any application where lacquer is suitable, with substantially reduced finishing costs. Satisfactory equipment for applying hot lacquer is now available at reasonable cost from several manufacturers.

Mine Safety Appliances Company, on June 14, dedicated the world's largest research laboratory devoted to the development of safety equipment, in Pittsburgh, Pa. About 400 leaders in safety and industrial hygiene and health, as well as top industrial executives, attended the dedication exercises. Principal speaker was Ned H. Dearborn, Chicago, President of the National Safety Council.

The new laboratory was dedicated to the memory of John T. Ryan, pioneer in the field of industrial and mine safety and co-founder of Mine Safety Appliances Company, who died in 1941. In the four-story laboratory building are high altitude chambers; dust, fume and gas chambers; a wind tunnel; and an electron microscope that permits study of dusts and other substances at a magnification up to 100,000 times.

Foster D. Snell, Inc., New York City, has announced the letting of contracts for the first of its laboratories in Bainbridge, N. Y. Construction will be of concrete and brick on approximately one acre acquired for the purpose. The present building is a single wing of a structure providing for four wings with extensions. The project does not envisage any change at present in the activities in New York.

Plating School in New York City. The College of the City of New York, School of Technology, will offer a course in Practical Electroplating for the Fall Semester. The course will be held on Monday evenings from 7:00 to 9:00 P. M. beginning September 25. Registration will be held September 19 and 21 in the evening.

The primary objective of this course is to provide commercial electroplaters with a sound understanding of the principles underlying their work. For details, address Prof. W. Willig, City College, New York 31, N. Y., or phone AD 4-2000 during business hours.

Tin Research Institute, Inc., Reports on First Year of Operation. Established in Columbus, Ohio in the Spring of 1949 to provide improved technical service to tin users throughout the United States, the Tin Research Institute, Inc. has for its functions: collection of information of value to tin users; distribution of information; and consulting service to assist industry in solving technical problems in the use of tin. A sponsorship with the Battelle Memorial Institute provides facilities for technical investigations and continues the relationship which has existed for many years.

The Institute abstracts about 150 periodicals, reprints research papers, makes surveys of the patent literature of the United States, Great Britain, France and Germany, and gains information on trends of industrial applications by plant visits and from trade literature. There is maintained in London and Columbus a file of collected information for future reference. Information is distributed to newspapers and scientific journals and to over 5,000 individuals in the United States, who are on the mailing list. In addition, in the last twelve months the Columbus office received 2,317 requests for publications and

Announcing

An Important Merger...

DARCO CORPORATION
ATLAS SUBSIDIARY

becomes

DARCO DEPARTMENT

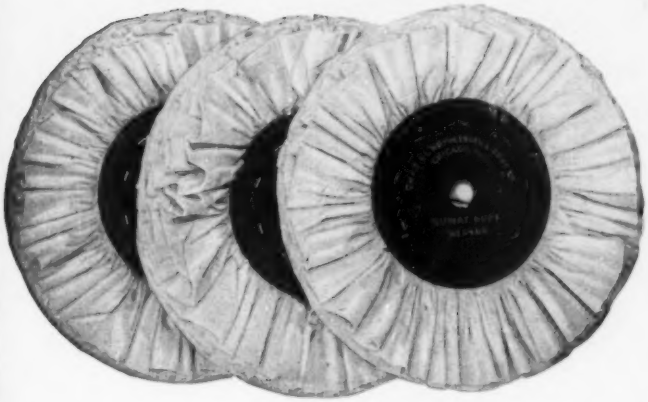
ATLAS POWDER COMPANY

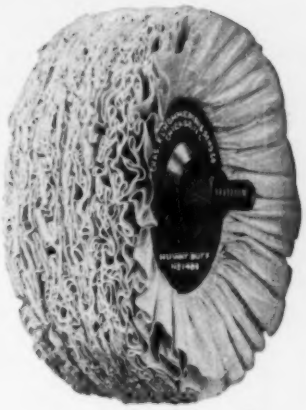
Darco Corporation, formerly an unconsolidated subsidiary, is now an integral part of Atlas Powder Company. Present Darco personnel and facilities—manufacturing, sales, and research—are continued in the Darco Department.

Darco plant expansion at Marshall, Texas, is being pushed to completion. With this added capacity—backed by Atlas Powder Company's resources and extensive research, development and engineering facilities—Darco is set to maintain its position as a leading manufacturer of activated carbons for the refining of cane, beet and corn sugars, for the purification of chemical products, vegetable oils and fats, water supplies, textile chemicals and dry cleaning and electroplating solutions.

DARCO DEPARTMENT
ATLAS POWDER COMPANY
Darco General Sales Offices
60 East 42nd Street, New York 17, N. Y.

RELIANCE PRODUCTS





NUWAY BUFFS

MANY FOLDS TO HOLD COMPOSITION USED FOR FAST CUTTING, FLAT AND ROUND SURFACE WORK.

EXTRUDED COMPOSITIONS

MORE COMPACT, NO LOSS FROM BREAKAGE, MORE ECONOMICAL.

RELIANCE MIDGET PLATING BARREL

TUB CAN BE LIFTED OUT FOR DUMPING AND TUMBLING BARREL INSERTED FOR TUMBLING INSTEAD OF PLATING—VERY RIGID—THREE SPEEDS.

Chas. F. L'Hommedieu & Sons Co.

MANUFACTURERS of

Plating and Polishing Machinery

Complete Plating Plants Installed

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WANT TO *Cut* PLATING COSTS?

A 91-foot Meaker Automatic Machine with 17 sequences.

Get Results with a MEAKER PLATING MACHINE

You save three ways with a Meaker plating machine. In many cases the savings in labor costs, space, and chemicals alone have paid for the Meaker equipment in a very short time. Increased production is a natural result. A better and more uniform plating job is assured. Furthermore, cleaner and more agreeable working conditions reduce personnel turnover to a minimum.

A Meaker machine makes every operation in the plating sequence automatic, or as mechanized as possible. It is the profitable way to do electroplating on a competitive basis. Large percentage savings have been the rule both in the plating departments with medium output and in the mass production plants.

Look to the handling methods in your plating work. There may be an opportunity to save a lot of money. Whatever your requirements call for—full automatic, semi-automatic, or a special machine—Meaker has the answer. Get the Meaker booklet. It shows actual installation photographs of machines that have reduced operating costs for others—these machines can do the same for you.

Ask for Booklet No. 148

MEAKER PRODUCTS

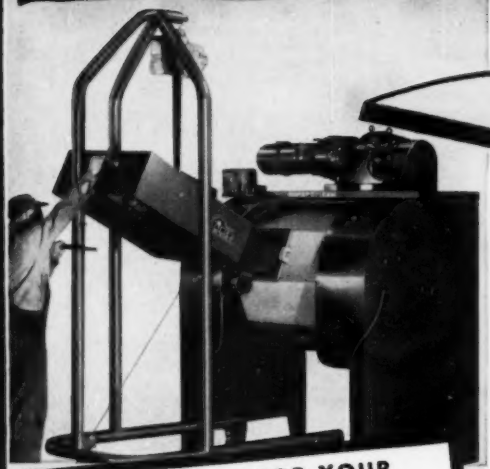
Serving the Plating Industry for over 50 Years

THE MEAKER COMPANY

1639 South 55th Avenue, Chicago 50, Illinois, Telephone Bishop 2-1920

DO ALL OF THESE PARTS WITH "ONE OPERATION" MASS PRODUCTION FINISHING AT A COST SAVING OF UP TO 95% WITH

ALMCO **Supersheen**
A Better Finish-FASTER



EQUIPMENT FOR YOUR SPECIFIC NEEDS

(1) Advanced Design PRECISION Tumbling barrels in sizes from 8" x 16" up to 60" x 30". (2) AUTOMATIC loading, unloading and separating equipment. (3) A vastly SUPERIOR grinding and finishing medium in 2 grades and 9 sizes.

DEBURR

Flat or formed stampings — **all** types and sizes . . . long, thin, slotted, etc. All common metals, including magnesium and copper. Machined parts with large burrs. Large, heavy or extremely light parts can be "one operation" processed without damage.

CUTTING DOWN, POLISHING, BURNISHING, PUTTING ON RADIUS

Castings — **all** types — **all** common metal alloys. Forgings before and after machining. Machined parts. Stampings requiring smooth surfaces and high colors.

DESCALE, DEBURR, POLISH

Forgings before and after machining. Heat treated parts. Welded or discolored parts.

COMPLETELY FINISH FROM CASTING OR FORGING TO PLATING OPERATION

Forged or cast brass, iron. Die castings of all sizes, shapes and types.

ALSO

Selective grinding. Low micro-inch surfaces equal to lapped finishes can also be obtained with absolute uniformity.

● GET THESE BENEFITS

A Better Finish **Faster** on widest range of parts. Reduced time, labor and material costs . . . **up to 95% saving!** Reduced rejections — stepped-up production. Unsurpassed uniformity — improved finish.

● OUR SERVICE TO YOU

We survey your requirements — determine by Trial Runs if ALMCO SUPERSHEEN is applicable. Furnish Engineering Data Card — specific fool-proof instructions on how to run each part. Train operators for highest efficiency. Furnish continuing information on latest finishing procedures.

FREE *Engineering Clinics*

Nationwide Network provides you with QUICKER and BETTER sample processing. Write today for details - or send unfinished samples for FREE Engineered Pilot Run and complete production cost data.

FREE SAMPLE PROCESSING ■ GET FACTS TODAY

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Please send me latest descriptive literature and address of nearest SUPERSHEEN Engineering Clinic.

NAME_____

ADDRESS_____

_____

America's Most Versatile "ONE OPERATION" Finishing Process

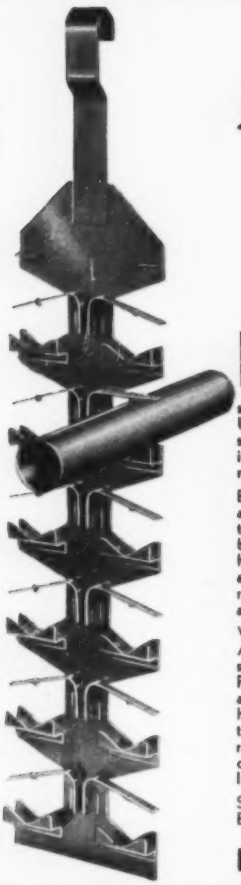
Industry News

10,982 publications were distributed in answer. Technical inquiries which require special attention are steadily increasing as the work of the Institute becomes more widely known. Consulting work necessitated 72 visits to plants by the staff and 55 individuals came to Columbus to discuss their problems.

A wide variety of publications are available free of charge to the practical user, to the analyst, and to the research worker. Practical handbooks on hot tinning, electrodeposition of tin and tin alloys, soldering, bearings, fusible alloys of tin, and bronze are available on request. An illustrated review, "Tin and Its Uses", is issued periodically. Anyone wishing to be on the mailing list for it or who desires other information on tin should communicate with Tin Research Institute, Inc., 492 W. 6th Avenue, Columbus 1, Ohio.

Detrex Corporation Industrial Division managers for all regions in the United States have just completed an intensive conference at the home office in Detroit, Mich. Technical information was released on the latest developments in the design, manufacture, and application of product-cleaning and rustproofing processes, equipment, and chemicals. New plans for merchandising these items and for extending consultation and free inspection services were also covered.

The De Vilbiss Company, manufacturers of air compressors and spray-painting equipment, and one of the world's leading producers of atomizers, which were invented by the company's founder more than 60 years ago, will soon establish a modern manufacturing plant in Somerset, Pa., it is announced at the company's general offices in Toledo, Ohio. The early start of operations in Somerset will greatly improve the company's competitive position, result in closer cooperation with many of its major suppliers, and permit more rapid and economical distribution to its customers, the company announcement said.



NEW!
Anodizing Rack Insulation

PASTE
Single Coat Primer
One
Top Coat Baked

AIR DRY
No Baking
All
Tough Air Dry

BUNATOL

special insulation for aluminum anodizing racks and fixtures. Unusual adhesion to metallic aluminum and made to withstand the strongly acid anodizing solutions. Makes rack insulation a profitable investment because racks will last so much longer with repair costs greatly reduced.

BUNATOL No. 796 is a new air-drying insulation for aluminum which, with a few coats, will give complete insulation coverage and protection. Thick liquid can be used by brushing or dipping. Permanently flexible with extra adhesion to stop seepage. Very tough to withstand cuts and abrasion. Synthetic resin base gives unsurpassed chemical resistance. No equipment necessary. Just clean the rack, apply a few coats and air dry.

Where a baking oven is available the use of the special Aluminum Primer and BUNATOL Paste No. 1002 will save time and labor. Just apply a single coat of No. X126 Primer and bake, and quickly dip a single coat of the Paste and bake; the entire operation in about two hours. The high gloss Paste is very thick and flexible and of extreme toughness to stand wear and shop abuse. Excellent chemical resistance. Designed to protect aluminum racks at very low over-all cost. No. 1002 Paste insulation will often last as long as the rack.

Save time and cost by insulating anodizing racks with BUNATOL. Get the facts—just write

Nelson J. Quinn Company
Toledo 7, Ohio

WANTED

Plating Department Superintendent to take charge of copper-nickel-chrome department, plating die castings and stampings. Must be well grounded technically, able to secure production and administer leadership to three-shift operation.

HARDY MFG. CORP.
Pendleton, Indiana

GENERAL JOB PLATING SHOP

Sales $42,000 year, can increase; modern equipped plant, four years old; established twenty years; accounts with large industrial concerns; excellent personnel; retiring; terms.

APPLE COMPANY BROKERS
CLEVELAND, OHIO

CADMIUM PLATING PLANT

Cleveland suburb; fully equipped; like new; 100 pound crown barrel plater; building 30x40; rent $80; large clientele; price $11,000.

APPLE COMPANY BROKERS
CLEVELAND, OHIO

PLATING CHEMIST

B.A. in chemistry from University of Connecticut (physics and mathematics minors) with extensive experience in electroplating production, control and research, especially plating on high-alloy steels, copper-base alloys and aluminum alloys, heavy-nickel deposition, and bearing plating. Mechanical and electrical skills; 30 years old, married, excellent health. Wishes to locate in the Northeast.

P-850-A PLATING
P. O. Box 168, Jenkintown, Pa.

HELP WANTED

Research Associate of American Electroplaters' Society to work at National Bureau of Standards on permeability and protective value of electroplated coatings. College graduate with at least two years' experience, preferably in electrochemistry. Salary $4,000 to $5,000 per year. Send application, qualifications, and minimum acceptable salary to Clarence H. Sample, International Nickel Company, 67 Wall Street, New York 5, N. Y.

P-850-B, PLATING
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FREE . . . *NEW* FEDERATED ANODES CATALOG!

This new Federated ANODES catalog is full of facts that every man in the plating business should know.

Emphasizes usable data on M-Sterling Chill-formed copper anodes, and those of zinc, tin, brass and cadmium. Anodes are listed in full detail as to size of body, length of hooks, position of markings and other essentials. Drawings indicate shapes, dimensions, styles of ribs and cores.

To get copies of this anode catalog, or to fill any of your plating needs, call or write any one of Federated's 25 sales offices across the nation.

Federated Metals Division

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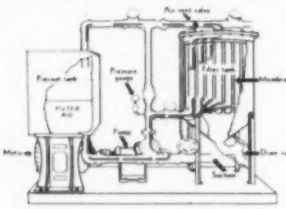
AMERICAN SMELTING AND REFINING COMPANY • 120 BROADWAY, NEW YORK 5, N. Y.

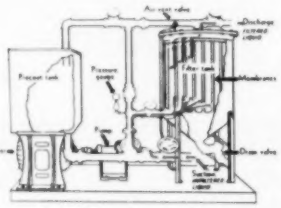
Titeflex filters are high in efficiency . . . their operation is so simple that costs are lower than with other methods. They require no replacement parts such as bags, sheets, etc. They are cleaned by an efficient backwash system, entirely eliminating waste labor. And they produce the *highest possible* degree of filtration.

Write for complete catalog showing all models

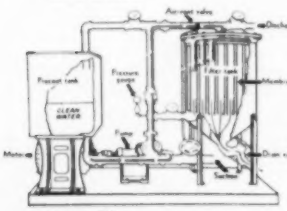
Simple 3-step operation ups efficiency, saves money



PRECOATING—Precoat of inexpensive filter-aid is built up on outside of permanent membrane cylinders.



FILTRATION—is started merely by turning proper valves. Titeflex filters can accommodate more liquid than any other equipment with equal filtration area.



BACKWASHING—Cleaning is accomplished by reversing flow of liquid through membranes. Operation is completed in minutes and it is unnecessary to remove residue manually.

Titeflex, Inc. 500 Frelinghuysen Ave. • Newark 5, New Jersey

TITEFLEX FILLS PLATING REQUIREMENTS TO A . . . T

Personals

G. W. Fine is now Assistant Sales Manager of U. S. Stoneware's Plastic Coatings Division, Akron, Ohio. He studied chemical engineering at Case School of Applied Science and had been associated with

Fine

Sherwin-Williams Company for seven years, first as a laboratory technician and, upon his discharge from U. S. Army Air Force, as a member of the sales staff. He is married, has two children and makes his home in Aurora, Ohio.

Henry S. Rawdon was elected an honorary member of the American Society for Testing Materials at its recent Atlantic City meeting. Until his retirement, he was for thirty-five years associated with the National Bureau of Standards, Washington, D. C., becoming Chief of the Division of Metallurgy. His activities in A. S. T. M. were largely in the metals field, notably in the committees on corrosion—A-5 on Corrosion of Iron and Steel and B-3 on Corrosion of Non-Ferrous Metals and Alloys of which he was formerly Chairman. Other long-time activities included the fields of metallography and fatigue of metals.

Joseph E. Rhoads has been appointed General Manager of The Plating & Galvanizing Company, Cleveland, Ohio and will be in charge of all company operations: cadmium, nickel, brass, copper and

Rhoads

zinc plating and hot dip galvanizing. He was previously Vice-President of the Progressive Plating Corporation, Elyria, Ohio and formerly associated with Brown Lipe Chapin Division of General Motors, Elyria. He is a graduate of Case Institute of Technology.

T. S. Fuller, Engineer in Charge of Works Laboratory, General Electric Company, Schenectady, N. Y., was elected Vice-President for a two-year term at the

ANOTHER R-A SCOOP!

12 VOLTS
5,000 Amperes
BASIC RECTIFIER

A NEW SELENIUM RECTIFIER

For *HIGH DEPOSITION*

IN these dead-line days, doing good work FAST is a "must"! And it's easily possible with this new R-A Selenium Rectifier, which was designed for a high rate of deposition. It delivers 5,000 Amps. at 12 volts—all from one cabinet that can be located in any spare space.

This rectifier is also very economical. It draws only the power needed to plate the work in the tank. Where tanks are empty, no power is lost . . . and it requires practically no servicing over the years.

We supply rectifiers from 250-10,000 Amps. in 250 Amp. steps, for a wide range of industrial and laboratory needs. Full information on request.

RICHARDSON-ALLEN

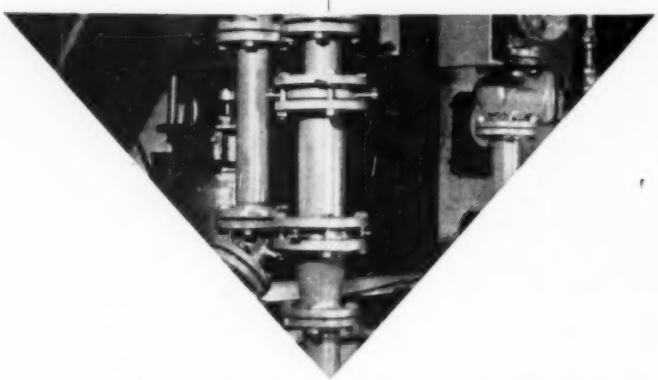
RECTIFIER SPECIALISTS

Richardson-Allen Corp., 15 W. 20th St., New York 11, N. Y.

SARAN
LINED
steel
pipe

available immediately — readily field fabricated

resists corrosion



Saran's unusual resistance to most corrosive chemicals and solvents plays an important part in the reduction of shutdowns and lost production! Saves time and labor!

Saran lined steel pipe is available in maximum lengths of 10 feet and in sizes from 1 to 6 inches inclusive. Also available are saran lined plug valves, Saunders type diaphragm valves, flanges, reducing flanges, flanged fittings, gaskets and fittings with union ends.

Write us today for further information concerning saran lined steel pipe and how it may help solve your production problems. Manufactured by The Dow Chemical Company, Bay City, Michigan, distributed nationally by Saran Lined Pipe Company, Dept. TSP-47.

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SARAN LINED PIPE
DOW
product

Personals

recent meeting of the American Society for Testing Materials in Atlantic City. An up-state New Yorker, Mr. Fuller graduated from Syracuse University in 1911 with a B.S. in Chemistry. His entire industrial experience has been with the General Electric Company, first as chemist, later as metallurgist in the Research Laboratory at Schenectady, then Engineer of Materials, and in his present position as Engineer in Charge of Works Laboratory since July, 1945.

A long-time member of Committee B-3 on Corrosion of Non-Ferrous Metals and Alloys, he served as Chairman of this important committee from 1926 to 1940. During this period the committee inaugurated many extensive corrosion tests. Other technical work in which he has been and is still active includes corrosion of iron and steel.

Louis V. Gagnon of Natick, Mass., has been appointed New England representative of the Bart-Messing Corporation, Brooklyn 6, N. Y. Since 1946, Mr. Gagnon had been in charge of the Razor Finishing departments at the Gillette Safety Razor Company. Over the past

Gagnon

fourteen years he has been associated with such other companies as United-Carr Fastener Corporation, A. S. Campbell Company, and the Cambridge Plating Company. He is a graduate of Franklin Technical Institute in Industrial Chemistry and of the Lowell Institute School at M. I. T. in Mechanical Engineering. He is well known throughout New England because of his activities in the American Electroplaters' Society and has just completed his third year as president of its Boston Branch.

Robert Richmond has been appointed Assistant Purchasing Agent of the U. S. Stoneware Company and its affiliates: Chamberlain Engineering Corporation, Colonial Rubber Company, Federal Refractories Corporation, Super Machine Company, Ravenna Ceramics Corporation, Republic Lead Equipment Company, Hamilton Kent Manufacturing Company, and Conneaut Rubber & Plastics Company.

Dr. K. Schumpelt has joined the Forstner Chain Corporation of Irvington and Union, N. J., to organize and operate

FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE A 920.

"Buffing Compound Removal ~~was~~ a Tough Job!!!"

● That's the title of the booklet describing in detail Cowles SO Cleaner—the remarkable new buffing compound remover *which really works.*

SO will effectively loosen the most stubborn, heavy, impacted, ground-in buffing compounds for subsequent removal in the electrolytic tanks. The latest developments in metal cleaning research have been incorporated in this new product. Its superior penetrating and wetting action quickly loosens dirt and impacted buffing compounds from *any metal.* SO can be used in still tank, fully and semi-automatic machines and is compatible with a wide range of temperatures. Because SO produces stable emulsions at low concentrations, it assures thorough rinsing.

COWLES CHEMICAL COMPANY
METAL CLEANER DEPARTMENT
7016 Euclid Avenue · Cleveland 3, Ohio

The Booklet gives you complete information—send for it today. The coupon is for your convenience.

COWLES CHEMICAL COMPANY
7016 Euclid Avenue
Cleveland 3, Ohio

Please send me your folder "Buffing Compound Removal ~~was~~ a Tough Job!!!"

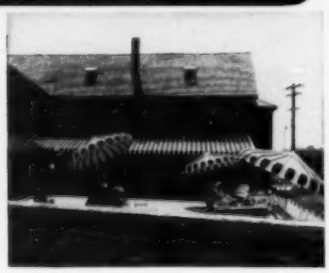
Name _____

Company _____

Address _____

City _____ Zone _____ State _____

KOOLVENT VENTILATED
ALUMINUM AWNINGS
ARE *Alodized**
FOR EXTRA DURABILITY!
EXTRA PAINT PERMANENCE!



Modern, colorful KoolVent Awnings are designed for all-weather service in all seasons. That means these permanent, ventilated aluminum awnings must withstand the ravages of all elements and all foreign substances — sun, rain, snow, sleet, smoke, industrial fumes, dust, dirt, salt air, soapy water — so destructive to paint life.

To provide the necessary paint-bonding and protective coating that meets the rigid service requirements of KoolVent Awnings, the manufacturers† of KoolVents use "Alodine" to anchor the paint finish and preserve its lustrous beauty.

*"Alodine"®

ALODIZED ALUMINUM provides enduring finish beauty and metal preservation. This fact, called to the attention of your customers by the attractive ALODINE seal, will give your products an extra selling point. The ALODINE seal is available to all qualified users of ALODINE. Details on request.

†KoolVent licensees using "Alodine" and/or Alodized aluminum include:

KoolVent Metal Awning Co. of Cleveland, Cleveland 15, Ohio
KoolVent Metal Awning Corp. of America, Texas Division, Dallas, Texas
KoolVent Metal Awning Co. of Pittsburgh, Glenshaw, Penna.
KoolVent Metal Awning Corp. of Michigan, Detroit 4, Michigan
Aluminum Awning Co. of Arizona, Phoenix, Arizona
KoolVent Aluminum Awning Co., Mercerville, New Jersey
KoolVent Metal Awning Corp. of Indiana, Pendleton, Indiana
KoolVent Metal Awning Corp. of Chicago, Elmwood Park 35, Illinois
KoolVent Aluminum Awning, Div. of Duralco Mfg. Co., Inc., Wheeling, West Virginia
KoolVent Awnings Limited, Oshawa, Ontario
Eastern KoolVent Aluminum Awning Inc., Mineola, Long Island, N. Y.
KoolVent Aluminum Awning Co. of Arkansas, Inc., Little Rock, Arkansas
KoolVent Awnings Limited, Montreal, Quebec
KoolVent Metal Awning Corp. of N. E., Waltham 54, Mass.
KoolVent Metal Awning Co. of P.R., Inc., MacMurray & Co., Inc., Hato Rey, Puerto Rico
KoolVent of California, Inc., Los Angeles, California
Penn-Ohio KoolVent Metal Awning Corp., Girard, Ohio
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Pioneering Research and Development Since 1914

AMERICAN CHEMICAL PAINT COMPANY

AMBLER, PA.

Manufacturers of Metallurgical, Agricultural and Pharmaceutical Chemicals

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Personals

laboratories for production control and metallurgical research. His 21 years of service with Baker & Company, Inc., Newark N. J., will be continued in an advisory capacity.

J. "Doug" Charters, District Sales Manager of the Houston, Texas, Division of Turco Products, Inc., has been transferred to the Northern California Sales

Charters Williams

District, with headquarters in San Francisco. He fills the vacancy which occurred on the death of **Al Martinez** early in June. **"Chris" Williams,** a native Texan, who has been assistant District Manager in Houston for the past six years, moves into the spot left vacant by Mr. Charters' transfer.

D. J. Richards, Vice-President of Sales, E. F. Houghton & Company, Philadelphia, has been placed in complete charge of all domestic and foreign sales activities since the recent death of **G. W. Pressell,** formerly Vice-President and Director of Sales. Mr. Richards will also act as Director of Advertising and will supervise the activities of the Product Development and the Sales Development Department.

John F. Maisch has been appointed Controller of the company.

R. M. Brown, formerly Sales Engineer with the Bristol Company of Canada, Ltd., and lately instrumentation engineer

Brown

with Stadler Hurter & Company, Montreal, Consulting Engineers, has rejoined The Bristol Company and will be stationed at Baltimore, Md. Mr. Brown is well known in instrument circles and is the author of several papers on the application of instruments.

DON'T

Let Chromic Acid Fumes

SMOTHER YOUR PROFITS!

For over three years, NO-CRO-MIST has been helping Chrome Plating in these important ways:

MAINTENANCE

Solves the problem of maintenance of ventilating equipment; keeps chromic acid in the tank where it belongs instead of letting it destroy ventilating equipment, roofs, grass or automobile finishes. Re-racking between nickel and chrome can be avoided; busbars are kept cleaner.

ECONOMY

Can be used economically in any strength bath containing 25 to 54 oz./gal. chromic acid by improved system for addition. Saves chromic acid.

BETTER OPERATION

Improves covering power and extends the plating range of the bath. Solves many problems of plating around holes and recesses.

SAFEGUARDS HEALTH

NO-CRO-MIST is a soluble addition agent that eliminates up to 95% of chrome spray evolved in plating. This means that fumes are eliminated from the plating room (especially noticeable in summer) and health of workmen is safeguarded.

FOR FREE ONE GALLON SAMPLE — PIN COUPON TO YOUR LETTERHEAD!

ROHCO

ROHCO PRODUCTS
NO-CRO-MIST • HULL CELL TEST • ROHCO 20XL CADMIUM BRIGHTENER ROHCO 100 BARREL ZINC BRIGHTENER • RINS-AID • CROMETER

R. O. HULL & CO., INC.
1302 Parsons Court
Rocky River 16, Ohio

Canada: Armalite Company, Ltd.
Toronto 6, Canada

"YOUR PLATING IS BEST WITH THE HULL CELL TEST"

FREE—JUST PIN THIS COUPON TO YOUR LETTERHEAD!

R. O. HULL & CO., INC.
1302 Parsons Court
Rocky River 16, Ohio

Gentlemen: PLEASE SEND A FREE SAMPLE (One Gallon) OF NO-CRO-MIST FOR MY EVALUATION.

Chrome Tank Size ..... Gal.
Operating Temperature ..... °F.
Chromic Acid Content .....

NAME .....
COMPANY .....
STREET ADDRESS .....
CITY ..... ZONE ..... STATE .....

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 923.

Personals

Edison C. Sickman, formerly Baltimore District Sales Manager, has been appointed General Sales Coordinator of the Atlas Mineral Products Company, Mertztown, Pa. He received his B.A. degree at the University of Dayton and has done work at Wittenberg College, Indiana University and Antioch College. Prior to joining Atlas, he worked in various phases of management and sales in the plating-supplies and metal-finishing fields.

Ray Russell Graver has accepted a position in the Atlas Engineering Department. He recently received his B.S. degree in chemistry at Muhlenberg College. **Gerald F. Gilbert, Jr.,** who recently received his B.S. degree in Chemical Engineering from Lehigh University, is now assistant to the Technical Director.

Richard A. Weppner has been appointed Sales Engineer in Delaware, Maryland, Virginia, and parts of West Virginia and New Jersey. He holds B.S. and M.S. degrees in Chemical Engineering from the University of Notre Dame and has had over twelve years' experience in sales and consultation in corrosion-resistant materials, solvents, coatings, and plastics. Prior to joining Atlas he was with the Pennsylvania Salt Manufacturing Company.

William A. Streaker has been appointed Sales Engineer in the lower peninsula of Michigan, Eastern Indiana, and Lucas County in Ohio. He received his B.S. degree in Chemical Engineering from the University of Illinois and prior to this appointment was in the Atlas Engineering Department. Before joining Atlas he was associated with the General Electric Company.

Philip E. Berens has become Sales Representative in Eastern Pennsylvania, Western New York and parts of New Jersey. He has served part of this territory for Atlas before and more recently has been located in the Detroit Territory. He received his B.A. degree in Chemistry from the University of Pennsylvania and prior to joining Atlas was General Manager of the Electro-Chemical Supply and Engineering Company.

Frank Watt has been appointed General Sales Manager of the Metal Finishing Equipment & Supplies Division of Frederic B. Stevens, Inc., Detroit. Widely

Watt

known throughout the plating industry, Mr. Watt has been a member of the sales and engineering department of the Stevens organization for the past 17 years. In addition to his new duties, he will also continue to contribute to the engineering and design of Stevens plating equipment.

Robert J. Bordeau has been appointed District Manager for American Buff Company and the Automatic Buff Company Division, both of Chicago, for the Cleveland and Northern Ohio territory and will make his headquarters in the Leader Building, Cleveland. He recently represented W. R. Brown Corporation, Craftint Manufacturing Company, White Aircraft Corporation, Super Manufacturing Corporation, Red Band Products Company, and other manufacturers of industrial finishes.

Richard Collins and **Robert Furrow** are now field service engineers with Klem Chemicals, Inc., Dearborn, Mich.

Mr. Collins, who was previously with the Harshaw Chemical Company, will service accounts in the Detroit, Flint and Saginaw sections. Mr. Furrow, who has been connected with the Detroit Ordnance District and King Seeley Corporation, Ann Arbor, Mich., will represent the company in western Michigan.

W. H. Lucking has been appointed Assistant Sales Manager of Antara Products, General Aniline & Film Corporation. He will make his offices at 444 Madison Avenue, New York City. An alumnus of Pennsylvania State College, he did production research work in the chemical

"BUCKY" Says....

for best results you can't beat

BUCKINGHAM
POLISHING
AND BUFFING
COMPOSITIONS

- Stainless Steel Composition
- White Finish
- Tripoli
- Chrome Coloring Composition
- Greaseless Composition
- Emery Cake
- Brass Coloring
- Emery Paste
- Aluminum Coloring
- Grease Stick
- Spray Pastes—Oil and Emulsion types

Representation in Major Cities

Write Dep't B for Samples

The BUCKINGHAM PRODUCTS Co.

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and metal industries from 1916 to 1920. He was subsequently with National Aniline, the Huber Company, and the C. K. Williams Company, joining the sales staff of Antara Products in 1948.

Lewis W. Lammiman, a veteran of twenty-five years with the company, has been named Technical Service Manager in the paint spray division of the De

Lammiman

Cochrun

Vilbiss Company, Toledo, Ohio. He has been a regular contributor to trade publications and has talked before many trade and technical groups in all parts of the country.

John W. Cochrun, formerly with Bendix-Westinghouse Automotive Air Brake Company, fills the position of Equipment Service Manager. He is a Purdue graduate with many years of experience in service training and administration.

Carl P. Quanz is now Plant Manager in charge of all activities at Bridgeport Brass Company's Indianapolis mills. He is succeeded as Chicago District Sales Manager by **Irving M. Malsch,** who in turn is succeeded as Indianapolis District Sales Manager by **David L. Nessler.**

Alfred N. Young has been appointed sales-service representative of Pennsylvania Salt Manufacturing Company's Special Chemical Department in the St. Louis area, succeeding **Charles R. Sorber, Jr.,** who was recently transferred to the Cincinnati territory.

Young, a native of the Mid-West, born in Marissa, Ill., comes to Pennsalt from the Harrison Lumber and Hardware Company of St. Louis. Prior to that he was with the sales department of the Grasselli Division of E. I. duPont de Nemours & Company.

Nils Walter Swenson is now Assistant Manager of Branch Sales for the Mechanical Goods Division, United States Rubber Company. He was formerly Manager of Mechanical Goods Sales for the Company's Buffalo, N. Y., branch. He will make his new headquarters at the company's New York offices in Rockefeller Center.

Dr. Max T. Goebel, Assistant Technical Director of the duPont Company's Grasselli Chemicals Department, has been appointed Technical Director, succeeding **Dr. John C. Woodhouse,** who has undertaken a special assignment with the company.

A native of Compton, Ill., Dr. Goebel attended Carthage College, Ill., and received his A.B. and Ph.D. degrees in chemistry from the University of Illinois. He joined duPont in 1934.

Phil H. Richey has been appointed Personnel Director of Detrex Corporation, Detroit, Mich., manufacturers of industrial cleaning processes, drycleaning machinery, and cleaning and rustproofing chemicals.

Dr. L. P. Seyb, since 1942 a chemist and group leader in the Research Department of Diamond Alkali Company, has been named Manager of Research. He succeeds **J. E. Underwood,** who relinquishes the post he has held for the past six years to become a research consultant for the company.

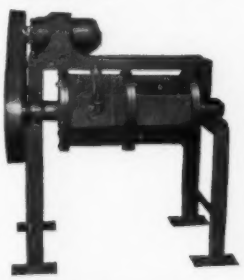
Dr. Seyb first came to Diamond from the Phillips Petroleum Company, Bartlesville, Okla. His research work with Diamond has included product development in the fields of wetting agents and inorganic silicates. A native of Franklin, Iowa, Dr. Seyb attended Culver-Stockton College, Canton, Mo. He received his B.A. degree in Chemistry from Coe College, Cedar Rapids, Iowa, his M.S. degree from the University of Iowa, Iowa City, Iowa, and his Ph.D. degree in Organic Chemistry from the same university in 1939.

D. C. Miner, Advertising Manager who joined the firm in 1934, and **William K. Barclay, Jr.,** Philadelphia president partner of Stein Bros. & Boyce, members of the New York and other leading Stock Exchanges, have been elected to the

ON SMALL JOB LOTS

FINISHING COSTS TUMBLE

TILT-TYPE BENCH MODEL — motor or belt driven. Adjustable elevation. Steel, wood, rubber lined or alloy metal barrels.



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Platers' Quiz

Question:

What is the difference between "high quality" and "low cost" plating?

Answer:

The difference to your customer is satisfactory instead of unsatisfactory service life.

The difference to the plater is high quality repeat business and an established reputation instead of low profit, low cost jobs.

Result:

Buyers soon learn that a durable high-quality finish is a sound investment. They will depend upon those platers who in their experience have consistently provided an adequate coating.

Plating that meets approved specifications helps everyone concerned . . . platers, manufacturers, consumers . . . and assures the reputation of electrodeposited coatings as a practical durable finish.

Yes, I would like a free copy of the ASTM and AES "Specifications and Tests for Electrodeposited Metallic Coatings."

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The International Nickel Company, Inc.
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Company _____

Address _____

City _____ *State* _____

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N.Y.

HALF + *the other* HALF

of this advertisement is concerned with Fluid Film metal forming lubricants developed for ferrous and non-ferrous metals. Fluid Film compounds are semi-plastic emulsions of great film strength —non-pigmented only . . . Fluid Film products are specifically compounded for 1. Brass and Brass Alloys, 2. Cold Rolled Steel, Enameling Iron, Stainless steel and Aluminum, 3. Alloys of Steel, Aluminum and Copper . . . Fluid Film products will handle light, medium and heavy operations . . . may be applied by brush, rollers, spray or dipping.

of our activity concerns NORTHWEST products and processes for chemically cleaning ferrous and non-ferrous metals preparatory to plating, vitreous enameling, painting, etc., each problem involving a specific programing of one or more of the thirty-five standard NORTHWEST Cleaning Compounds including Electrolytic, Immersion, Solvent, Spray, and Water-Wash types . . . *A request on your letterhead will bring a technician to consult you on your drawing and cleaning problems . . .*

the Whole . . . story is that it has been proven logical that the same technicians who supply the correct lubricants for drawing metals also provide the material for making them chemically clean afterward.

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REGENERATION
of
CHROMIC ACID
SOLUTIONS
by
CATION EXCHANGE

Mutual's

ANSWER TO THE CHROMIC ACID WASTE DISPOSAL PROBLEM . . .

Where spent chromic acid solutions containing dissolved metals pose waste disposal problems, the ideal answer—elimination of the waste and regeneration of the chromic acid solutions for re-use—may be realized by employing oxidation resistant cation exchange resins. Research chemists at Mutual Chemical Company of America have recently completed a preliminary investigation of the applicability of this technique to anodizing, copper stripping, brass pickling and chromium plating baths. Utilization of this principle appears feasible for other metal treatments employing chromic acid—with marked savings in processing costs.

Write today for a copy of "Regeneration of Chromic Acid Solutions by Cation Exchange" Mutual's Serial No. 65.

SINCE 1845 **MUTUAL CHEMICAL CO. OF AMERICA**
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Personals

Board of Directors of E. F. Houghton & Company at a meeting held July 21 in the company's main office, Philadelphia.

Buck M. Rogers is now with Nicholl Hard Chrome Service, Detroit, Mich., platers of tools, dies, and gauges. He was

Rogers

formerly with De Luxe Hard Chrome Service and before that dealer in industrial real estate and salesman with La Salle Electric & Mill Supply Company and Liberty Highway Company.

R. Lee Hundley has been appointed District Manager for the State of Wisconsin and surrounding territory of the McAleer Manufacturing Division, Higbie Manufacturing Company. His office will be located at 617 N. 2nd Street, Milwaukee 3, Wis.

For the past twenty years he has been connected with a large copper and brass mill and fabricator and has also gained considerable experience in the ferrous and nonferrous diecasting field. He is a member of the American Society for Metals and the American Electroplaters' Society.

O. B. Ellis, Senior Research Engineer, Armco Steel Corporation, Middletown, Ohio, received the Sam Tour Award for his 1949 paper, "Effect of Weather on the Initial Corrosion Rate of Sheet Zinc", at the recent annual meeting of the American Society for Testing Materials. This award is presented for the purpose of encouraging research on the improvement and evaluation of corrosion testing methods and to stimulate the preparation of technical papers in this field

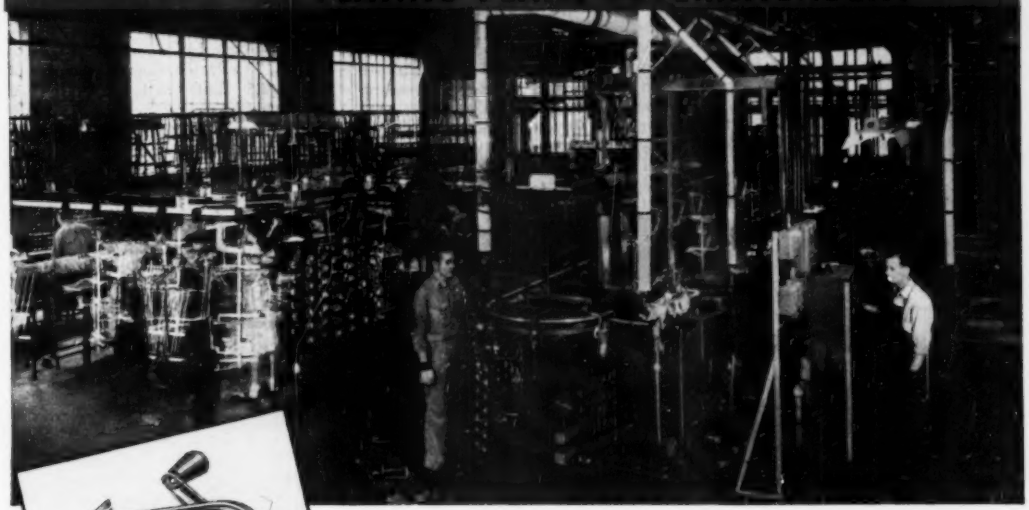
Obituary

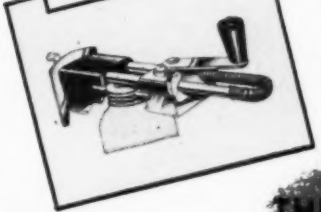
✙**Robert G. Suman** died at the age of 79 on June 30. He was a lifelong Dayton resident and for the past twenty years operated a plating business and acted as a plating consultant for various firms.

Mr. Suman was one of the founder members of the Dayton Branch of the American Electroplaters' Society, which was organized in March, 1913, and was an active member until his death. In March of this year, he was made an Honorary member of the Branch. He will be sadly missed by his friends and fellow members.

50% LESS MAINTENANCE, INCREASED PRODUCTION, BETTER QUALITY PLATING with our UDYLITE Equipment

says DAZEY CORPORATION'S PLATING PLANT SUPERINTENDENT





Dazey Corporation, St. Louis kitchen specialty manufacturer, is working around the clock these days. And, according to their president, Mr. William E. Gundelfinger, "We owe no small part of this activity to our Udylite plating installation—the finest equipment in America."

Dazey has two Udylite Full Automatic Plating Machines—one used for nickel plating and one for cadmium, a complete set of Udylite barrels and enough Udylite-Mallory Rectoplaters to provide sufficient current for their operation. Of this equipment, Mr. Dale Bolyard, head of Dazey's plating, polishing and finishing department, reports: "Our Udylite installation saves us 50% in maintenance, has increased production with better quality plating—as well as giving us a big saving in floor space." In addition, Mr. Bolyard has found Udylite equipment is extremely economical to operate.

This is no isolated case. Hundreds of other satisfied Udylite customers report the same results. This is one of the reasons the Udylite Corporation has consistently been the leader in the Plating Industry. There are many ways Udylite equipment can bring tangible benefits to your operations. Call in your nearby Udylite Technical Man today and have him show you how Udylite can provide greater economy and added profit for your plating plant. Or write direct to The Udylite Corporation, Detroit 11, Michigan. There's no obligation.

THE Udylite CORPORATION

DETROIT 11, MICHIGAN

PIONEER OF A [illegible] PLATING

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Trade Literature

L—468. Oiled Phosphate Coating (A Correction)—American Chemical Paint Company, Ambler, Pa., offers a revised Technical Data Service Sheet No. 11-5-3, which describes three grades of "Perolene", an oil-like chemical for producing an oiled phosphate coating on iron or steel which is later to be painted. Functions, conditions for use, application, equipment, control methods, and methods for paint preparation are also discussed. For your copy, use Reader Service Card.

L—469. Anodes—Federated Metals Division, American Smelting and Refining Company, 120 Broadway, New York 5, N. Y., has released a 12-page booklet on anodes for the plating trade. Regular anode products include M-Sterling Chill-formed copper anodes, electro-deposited copper anodes, lead anodes, and anodes of zinc, tin, brass, and cadmium. All are listed in full detail as to size of body, length of hooks, etc. Drawings illustrate the shape and dimensions of the various forms. For your copy, use Reader Service Card.

L—470. Electrolytic Cleaning—Following field testing under actual plant operating conditions, the Industrial Division, Du Bois Company, Cincinnati 3, Ohio, announces its new electrolytic cleaner Alkon, said to be suitable for direct- or reverse-current cleaning of ferrous and cuprous metals. It combines all the attributes of a hot tank cleaner—wetting, emulsification, soil suspension, hard-water control—with the necessary electrical properties. One of its features is foam control to eliminate solution spattering and minor explosions. Relatively low concentrations and long solution life give economical cleaning. A 6-page booklet, "An Introduction to Electrolytic Cleaning", contains general information on electrolytic-cleaning processes, explains the phenomena taking place during both direct- and reverse-current cleaning and the advantages of each process, discusses the properties to consider in the choice of a good electrolytic-cleaning compound, and gives a few typical cycles. For your copy, use Reader Service Card.

L—471. Blackening Copper, Brass, Zinc and Steel—Enthone, Inc., 442 Elm Street, New Haven, Conn., has published an 8-page illustrated bulletin describing "Ebonal Blackening Processes". For each process are given the scope, procedure, and characteristics of deposit. For your copy, use Reader Service Card.

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PHILADELPHIA 1632 Fairmount Avenue

L—472. Metal Protective and Paint Bonding Chemicals and Processes—An 8-page "Quick Reference List" issued by American Chemical Paint Company, Ambler, Pa., indexes by metal a variety of cleaning, brightening, pickling, and other treatments supplied by this company and describes each in some detail. Of special interest is a list of Government specifications and corresponding ACP treatment. For your copy, use Reader Service Card.

L—473. Tumble Finishing—Lupomatic Industries, Inc., 4510 Bullard Avenue, New York, has issued Bulletin PC-50 covering Tumb-L-Matic processes compounds, and carriers. The new bulletin describes basic steps for completely finishing metal and plastic part by wet and dry tumbling processes. All operations—cutting, smoothing, and lustering—are automatic and in most cases result in a highly lustrous finish without resort to costly polishing and buffing. Four charts indicate specifically which compound-carrier combination should be used for the different wet and dry processes. For your copy, use Reader Service Card.

L—474. Aluminum Treatments—Aluminum Cleaning and processing methods and materials for washing, burnishing, paint stripping, frosting, anodic-coat stripping, and steam cleaning are briefly described in a 16-page folder issued by Magnuson Products Corporation, 50 Court Street, Brooklyn 2, N. Y. Alkaline, acidic, and solvent materials are included. For your copy, use Reader Service Card.

L—475. pH and Chemical Control Items—Hartman-Leddon Company, Inc., 5821 Market Street, Philadelphia 39, Pa., has issued the 8th edition of Section C of its Catalogue. This 75-page book describes a large variety of indicators,

buffers, and reference solutions, colorimetric sets and papers for pH control; volumetric solutions of warranted accuracy and prepared reagents for many analytical procedures. For your copy, write to the company and mention PLATING.

L—476. Flow Exhibiting and Controlling Instruments—A 28-page illustrated catalog, describing new developments in flow exhibiting and controlling instruments for all industries, has just been published by Fischer & Porter Company, 50 County Line Road, Hatboro, Pa.

The basic Fischer & Porter devices for coupling a primary metering element to a secondary or exhibiting instrument are discussed along with the "Magnabond" magnetic clutch and the electric-impedance-bridge transmitting systems. The exhibiting instruments illustrated and described are flow indicators, recorders, integrators, and a new pneumatic controller unit. For your copy, use Reader Service Card.

L—477. Corrosion Resistant Paint—The U. S. Stoneware Company, P. O. Box 350, Akron 9, Ohio, has just released a 12-page illustrated Bulletin 712, which describes Tygon corrosion-resistant paint. It tells where and how to use Tygon Paint and where not to use it. The corrosion-resistance tables, based almost entirely on field experience, are unique in their completeness. For your copy, use Reader Service Card.

L—478. Corrosion Test Cabinets—Industrial Filter & Pump Manufacturing Company, 5900 Ogden Avenue, Chicago 50, Ill., has issued a revised catalog page describing its salt-spray and humidity test cabinets used in lacquering, painting and plating departments for the testing of coated metal. It gives detailed description of applications, design features, and the principal specifications of the different size models. For your copy, use Reader Service Card.

L—479. Nickel and Its Alloys—A new circular, "Nickel and Its Alloys", just published by the National Bureau of Standards, is a systematic and readily accessible summary of information about nickel: sources; extraction, recovery, and refining processes; metallography; chemical properties; physical properties; mechanical properties at different temperatures; and casting, fabrication, and miscellaneous processes. Many ferrous and nonferrous alloys are listed, and their properties, such as density, thermal conductivity, tensile strength, magnetic properties, and corrosion resistance, are discussed. The text is adequately illustrated with curves and tables.

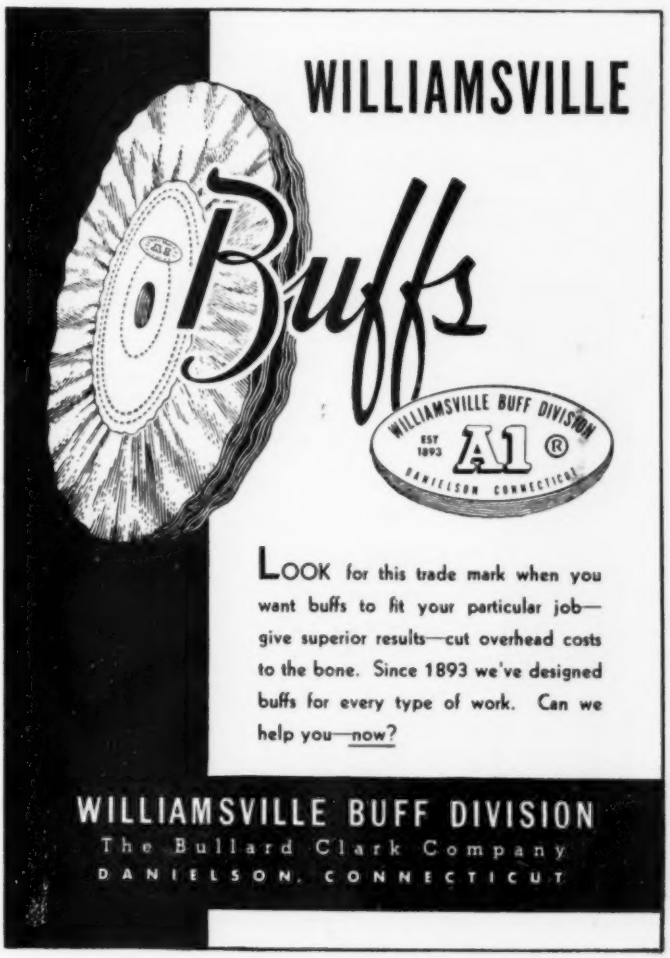
National Bureau of Standards Circular 485, "Nickel and Its Alloys", 72 large double-column pages, is available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., for 50 cents a copy. Remittances from foreign countries should be in United States exchange and should include an additional 17 cents to cover the cost of mailing.

L—480. Recording Thermometers—The Bristol Company, Waterbury 20, Conn., has published a 44-page illustrated Bulletin T-840 giving complete information on its "Series 500" line of thermometers. Liquid-filled, vapor-pressure, and gas-filled types are described in models for recording, indicating, controlling, and telemetering of temperatures, with information given on operating principles, characteristics of operation, temperature sensitive bulbs, recording charts and accessories. Resistance-type thermometers, humidity instruments, and time-temperature controllers are also included. For your copy, use Reader Service Card.

L—481. Coating Thickness Gauge—Henry A. Gardner Laboratory, Inc., 4723 Elm Street, Bethesda, Md., offers descriptive material about the Elcometer, a small pocket-size magnetic instrument for the measurement of thickness of organic and other nonmagnetic coatings on magnetic base metals. It is available with seven scales: 0–2, 0–3, 0–5, 0–10, 0–20, 15–40, 40–70 mils, and is said to have an accuracy of 5 per cent. For your copies, use Reader Service Card.

L—482. Preplated Metals—A graphic portrayal of the use of plated-metal parts is given in the bright, two-color "Flow Chart of Production of Plated Parts" just issued by American Nickeloid Company, Peru, Ill.

Line drawings tell the story of manufacturers who do their own plating vs. manufacturers who purchase pre-plated metals ready for fabrication and assem-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LOOK for this trade mark when you want buffs to fit your particular job—give superior results—cut overhead costs to the bone. Since 1893 we've designed buffs for every type of work. Can we help you—now?
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Keep corrosion costs down with Stortswelded Stainless Steel

STAINLESS steel tanks for cleaning and plating are not cheaper on the purchase order but they represent more tank for the money on the basis of performance. They reduce or eliminate the costs of repair, replacement and spoilage.

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You carry insurance on your Business, House, Car and Life. Why not on your plating tanks? They are the life blood of your business. It's cheap insurance to protect your equipment and production from baffling, costly and invisible short circuits by installing TRUE INSULATORS in your steam, water and air lines.

The TRUE Insulator

is manufactured especially for insulating plating tank coils; is of rugged construction, and easily installed.

Provides two inches of absolute insulation.

Fitted at each end with male couplings which grip the Rayon Braided Steam Hose permanently; and become an integral part of your steam, water and air lines.

Are available in the following sizes:

½ inch.....$6.50 per pair
¾ inch..... 6.50 per pair
1 inch..... 7.50 per pair

Discounts allowed for quantity purchases; special sizes considered for special uses.

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PRACTICAL PRODUCTS FOR PRACTICAL PEOPLE

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Trade Literature

bly. In the "old method", 15 different steps are pictured before the finished product is ready to ship, with the Nickeloid method only seven steps. Copies of the "Flow Chart" are being sent to interested manufacturers who write American Nickeloid Company, Peru, Ill., and mention PLATING.

L—483. Power Supplies—The Electric Products Company, 1725 Clarkstone Road, Cleveland 12, Ohio, offers a 10-page illustrated Bulletin 3-300, which gives an overall view of "E. P. Custom-Built Equipment for Industry", including plating motor-generators and rectifiers. Of special interest are excellent pictures of generator builders at work. For your copy, use Reader Service Card.

L—484. Deburring—A two-color 4-page bulletin issued by the Hydrohone Equipment Company, Schoolcraft, Greenlawn and Martz Avenues, Detroit, Mich., describes a new method of deburring and honing, "Hydrohone", for use on all types of metals. For your copy, use Reader Service Card.

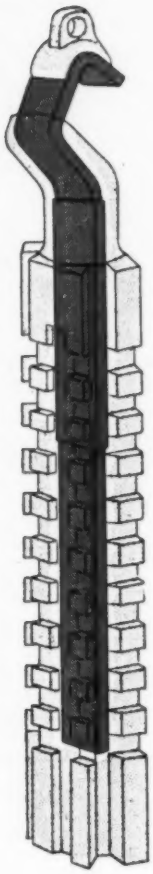
L—485. Corrosion Proofing.—The Atlas Mineral Products Company, 42 Walnut Street, Martztown, Pa., announces the publication of General Bulletin MCC No. 1. It briefly describes Atlas' complete line of chemical-construction materials, including linings, cements, brick and tile, brick sheathings, protective coatings, and floors. It also includes handy estimating data. For your copy, use Reader Service Card.

L—486. Belt Polishing—"Proving Ground for Production" is the title of a 4-page bulletin issued by Behr-Manning, Troy, N. Y. It describes the 16 "methods rooms" in which the company's methods may be tried out and lists their locations. It also illustrates a number of typical case histories. For your copy, use Reader Service Card.

L—487. Metal Sorting—A 4-page Bulletin 2005, issued by J. W. Dice Company, 1 Engle Street, Englewood, N. J., describes the high-speed automatic "Cyclograph" equipment for nondestructive sorting and inspection of metal parts by their metallurgical characteristics. Sorting speeds of 1–5 parts per second can be attained. For your copy, use Reader Service Card.

L—488. Rust Preventive Finishes—Rust-Oleum Corporation's, Evanston, Ill., story of industrial rust prevention is told in a new catalog. Directions relate to uses under general and special exposure of machinery and implement finishes, heat-resistant and chemical-resistant coatings, floor coverings, etc., and include

World's Finest Anode for Chromium Plating



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"COPPER CORE" Chromium Anode

Fabricated With NALCO ALLOY

- **This Anode** will conduct 250 amperes based on copper area alone.

  Natural flow of current to parallel edges makes entire surface self-cleaning, insuring complete saturation, instant distribution of current, and unusual throwing power. Greatly reduces plating time for a given thickness of deposit.

- **"Copper Core"** distributes current equally throughout the entire length of anode.

  The copper core is insulated from the lead casing above and below the solution level—which prevents flow of heavy surface currents and burning off at solution line. Conductivity is uniform at all solution levels, regulated only by the cathode depth.

- **"Copper Core"** and point current construction aids in immediate coverage.

  A one-piece copper hook maintains perfect contact — no heating at point of contact, no current failures to solution. "Copper Core" Anodes do not warp out of shape.

The GILBERT TRAMER *Co.*

POLISHING • PLATING SUPPLIES • EQUIPMENT

402 SWETLAND BLDG., CLEVELAND 15, OHIO

Trade Literature

practically three dozen different kinds of service and application. Color chips of at least seventy colors, plainly designated and reproduced, are accompanied by specifications indicating resistant qualities, drying time, thinner requirements, and methods of application. For your copy, use Reader Service Card.

L—489. Repair of Mechanical Equipment in Corrosive Service—Two-page Bulletin C-8 issued by the Carboline Company, 7603 Forsyth Boulevard, St. Louis 5, Mo., describes the use of corrosion resisting cements for repair of cracked, corroded, or broken pipe, pumps, valves, and other mechanical equipment made of steel, iron (and other metals), hard rubber, glass, porcelain, carbon, stoneware, wood, or plastic.

The synthetic-resin cements used are resistant to practically all acids, solvents, and alkalies up to 325° F. The only common acids which cannot be handled are sulfuric acid above 90 per cent concentration and nitric and chromic acids. When set, the repair cements are hard, resistant to abrasion, and can be machined if necessary. For your copy, use Reader Service Card.

L—490. Inspection for Porosity—Dy-Chek, a dye-penetrant method of inspection for every kind of metal, is described in circular issued by Dy-Chek Company, Division of Northrop Aircraft, Inc., 1515 E. Broadway, Hawthorne, Calif. For your copy, use Reader Service Card.

L—491. Surfactants—The action of surface-active agents is simply explained in an 8-page booklet published by Antara Products, General Aniline & Film Corporation, 444 Madison Avenue, New York 22, N. Y. It includes a list of the company's products and their uses. For your copy, write to Antara on your company's letterhead and mention PLATING.

L—492. Expired Detergent Patents—The first of a series of reports listing expired patents in certain fields of wide technical interest is announced by Patent Publications, Box 4094, Washington 15, D. C. It is a special grouping of 206 official abstracts of patents on the subject of detergents, dated from November 19, 1929 through May 30, 1933. Patents include 73 on metal cleaning, pickling and descaling and 25 on paint, varnish, and finish removers. The booklet contains a subject index and sells for $2.00.

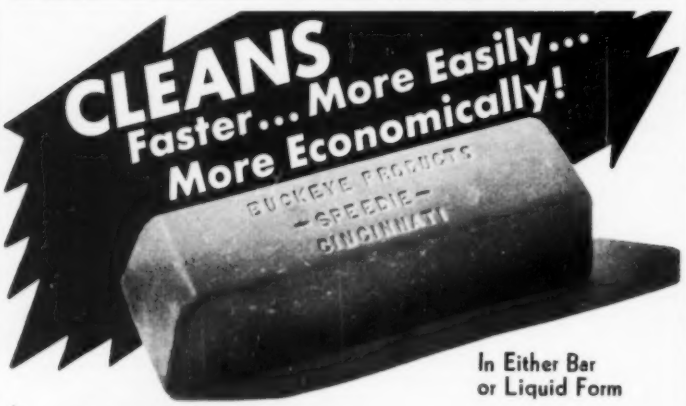
L—493. Fastening Devices—Holub Industries, Inc., Sycamore, Ill., offers two descriptive price sheets, TB-450 and LA-450, which illustrate three new types of "Hi" Fastening Devices, available in 66 sizes to meet anchoring needs in floors, walls and ceilings. The former describes devices for toggle bolts, the latter for machine screws and expansion bolts. For your copies, use Reader Service Card.

L—494. Dust Collection—Suggestions for collecting dust from a typical four-wheel grinding operation are given in a new Bulletin No. 616, issued by Aget-Detroit Company, Ann Arbor, Mich. Dimensions, as well as prices, are given for two of the 22 Dustkop models the company is prepared to ship from stock. For your copy, use Reader Service Card.

L—495. Colorimeter—Photovolt Corporation, 95 Madison Avenue, New York 16, N. Y., offers a 4-page illustrated Bulletin No. 409, which describes the Lumetron Photoelectric Colorimeter Model 401, recently placed on the market. It incorporates a number of novel features in performance as well as design. These include built-in high-efficiency stabilizer, use of inexpensive tubes or precision cuvettes, sliding tube carrier, sealed photocell, and operations from power line or battery. For your copy, use Reader Service Card.

L—496. Instrumentation Flow Plan Symbols—ISA Tentative Recommended Practice RP5.1, "Instrumentation Flow Plan Symbols", is now being mailed to all members of the Instrument Society of America, 921 Ridge Avenue, Pittsburgh 12, Pa. It was prepared to provide a satisfactory system of symbols and identifications for industrial process-instrumentation equipment and to designate and identify such equipment on flow plans and in other requirements. The system of symbols and identifications is the result of an extensive survey of the subject.

Copies of RP5.1 are $1.00 up to 20 copies, less in larger quantity.



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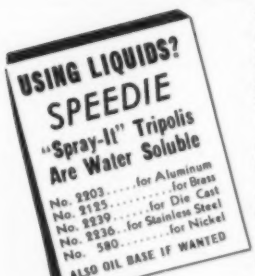

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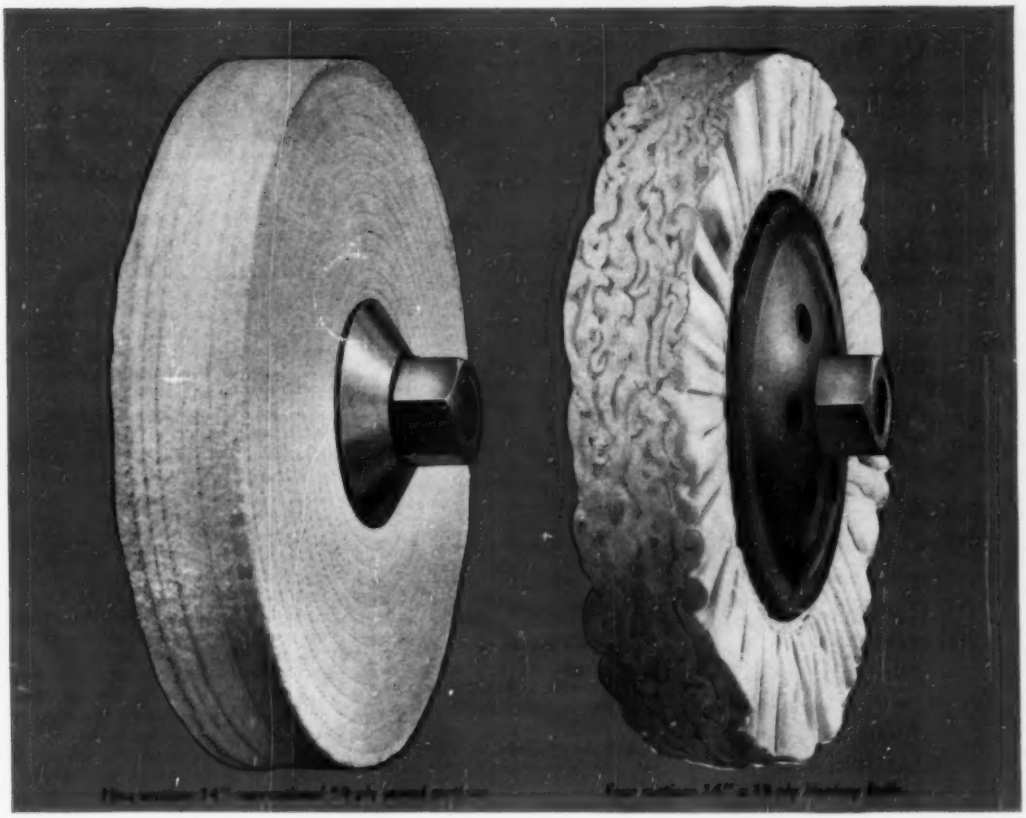

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The Mailbox

Subject: Analysis of Gold Alloy Solutions

DEAR SIR:

Your April, 1948 issue carried an interesting article by Mr. Karl Nell entitled, "Streamlined Analytical Control of Gold Alloy Plating Solutions".

We have now used his methods for several months, and should like very much to discuss our observations with him.

Following the instructions by Mr. Nell we easily obtain accurate results for gold and copper.

In the nickel determination, however, we find the quantities of reagents much too large for the nickel content of the solution, expecially the 10-ml quantity of 24 per cent sodium hydroxide solution, which almost completely removes the solution color. We have therefore changed the procedure as follows:

1. Pipette exactly 10 ml of A–10 solution, which must contain less than 25 gamma of nickel.
2. Add 5 ml 20 per cent potassium sodium tartrate solution.
3. Add 40 ml 0.5–*N* hydrochloric acid.
4. Add 25 drops of saturated bromine water.
5. Add concentrated ammonia until the solution discolors (about 35 drops), then an excess of 15 drops.
6. Add 2 ml 1 per cent dimethylglyoxime solution.
7. Make the colorimeter reading.

We have been entirely unsuccessful with the determination of dibasic sodium phosphate. At the end of the 10-minute period in step E-5 the color is so light that absorption is practically zero. It increases slowly but becomes usable only after a few hours.

What would be Mr. Nell's opinion about these two problems?

Very sincerely yours,
J. MERMILLOD
De Robert Freres
Geneva, Switzerlad

DEAR SIR:

We have had similar difficulties with the determination of nickel and phosphate as Mr. Mermillod and have therefore altered the methods slightly.

While dimethylglyoxime is an excellent indicator for nickel, it is not entirely exclusive, and of the metals often present in gold plating solutions, copper and iron might affect the results. In the outlined method the interference by iron is practically counteracted by the addition of the tartrate, but the effect of copper can hardly be overcome except by extraction of the nickel with ether, which is too cumbersome in routine analysis. Since copper will affect the colorimeteric reading, we have to choose a procedure that suffers the least deviation by the copper.

To this end we have made charts of the electrophotometer readings obtained using

(a) the method for nickel outlined in the article in PLATING
(b) the same method, except that in the last step only 5 ml of 24 per cent NaOH solution were added instead of 10 ml and
(c) the method suggested by Mr. Mermillod.

With uncontaminated samples all three methods gave rather straight lines both with blue and green filters. But when we contaminated portions of the original sample solution with copper and iron respectively, we found that the deviations in nickel reading caused by the presence of copper were by far the least in method (a), ranging from 3 to 21 per cent and averaging 12 per cent, while the readings with method (b) averaged 40.5 per cent low and with method (c) 71.5 per cent low.

Method (a) seems therefore to be the most advisable of the three when copper is present. This is in spite of the fact that the interference by iron is the highest in this method, where the alkalinity of the sample is extremely high, the deviation in method (a) averaging 20.5 per cent against 6 per cent in method (b) and 11 per cent in method (c). The quantities of copper and iron added ranged from one-third to an amount equal to the nickel content of the sample, which would be rather high for iron but not excessive for copper. The relatively high copper content sometimes found in used gold-alloy solutions is one more reason why precautions are more necessary against copper interference than against interference by iron.

If bleaching of the color occurs after the addition of sodium hydroxide in method (a), there is either an appreciable amount of copper present or the sample is too small. In the latter case one should take a 20-ml sample from the 250-ml volumetric flask into the 100-ml volumetric flask instead of the 10-ml sample originally suggested and valuate the chart accordingly. We have had good results that way.

In the *phosphate determination*, when the sample has evaporated to dryness as prescribed for the determination of gold, some of the phosphate present has given off one molecule of water per each two molecules of phosphate to form pyrophosphate, which does not give the blue-color

(Continued on page 987)

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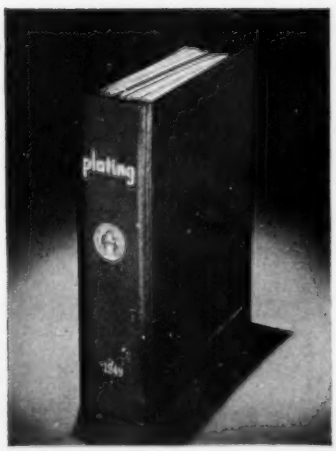

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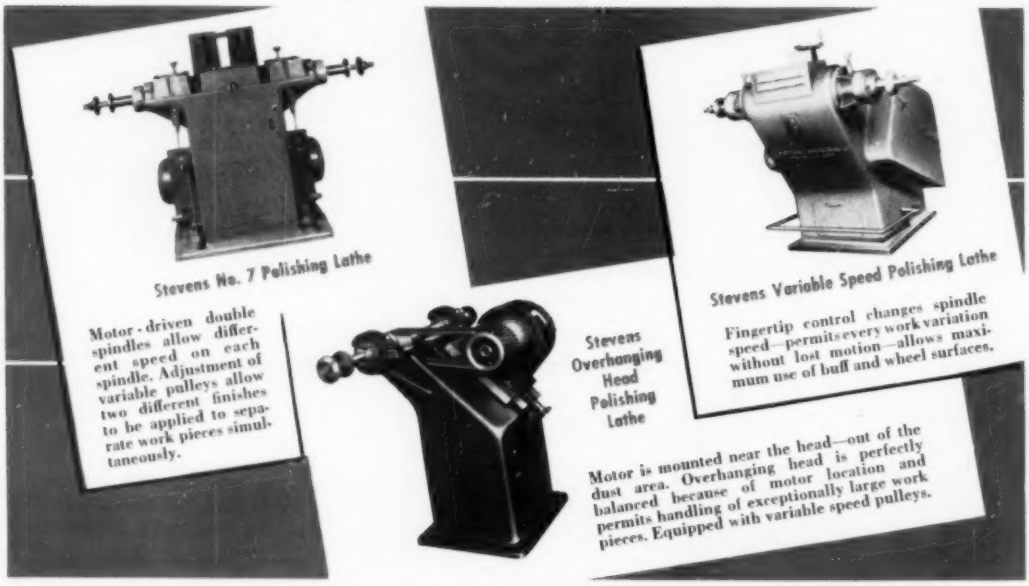

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plating

SEPTEMBER, 1950 VOL. 37 NO. 9

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Editorial

More About Seeing and Disbelieving

LAST MONTH WE POINTED OUT that technical and scientific literature may be misleading because of the ease with which too general conclusions are drawn from a limited number of data. This time we will deal with a second reason for disbelief, errors of observations, and especially with systematic errors.

These errors are caused by faulty measuring devices or by faulty experimental arrangement that does not permit control of all variables. The thermometer that always reads too high or the eye of a color-observer who is partially color-blind are examples of the former. It is evident that such devices will give correct results only if they can be and have been calibrated against reliable standards.

An example of a faulty experimental arrangement is the use of a Haring cell or a Hull cell at high current densities in long-time tests. Because much heat is evolved under these conditions and heat dissipation is slow, the solution temperature keeps rising during the test. Hence, in a study of the effect of current density, the higher current densities are accompanied by higher end temperatures, and observed differences may be due to temperature instead of current density. It is thus evident that smoothness of a curve is no criterion of its correctness. Only by the use of more suitable equipment can errors of this kind be avoided.

Even with the best experimental equipment, one is hard put to prevent systematic errors. For instance, a base-metal strip may be of progressively lower quality from one end to the other. This may introduce a systematic error if, in a series of tests, consecutively cut test pieces are used consecutively. Fortunately systematic errors of this kind can be avoided by using panels in a random order, for example, sixteen specimens in the order 2, 10, 7, 4, 5, 14, 6, 8, 12, 1, 16, 3, 11, 10, 15, 13, 9. Series of random numbers may be obtained from tables or by drawing numbered slips of paper from a hat. Unfortunately, randomisation converts to more easily handled accidental errors only such systematic errors that are independent of the variable being studied (it would not help eliminate the temperature error of the earlier example). There are, however, enough independent errors that randomisation, on principle, should be employed more generally.

Unless the experimenter report in papers and articles just how his tests were carried out, the reader is put to serious disadvantage. He should be able to employ a second mental device, critical examination of the experimental technique, before he accept either data or conclusions.

In a forthcoming issue, we shall deal with accidental errors and find other reasons for disbelieving what we see.

Gustaf Soderberg

SURFACE FINISH

of zinc-base diecastings

R. L. WILCOX

*Metallurgical Engineer and Chief, Nonferrous Metals Branch, Economic Cooperation Administration, Washington, D.C.**

The information presented here was originally prepared and assembled to serve in a manual for the instruction and guidance of diecasting-machine operators in the Detroit Division of Gerity-Michigan Corporation. Since it deals largely with surface finish, a subject of supreme importance to the plater, it is thought proper for publication on these pages.

MANY FACTORS influence the production of sound zinc-alloy diecastings with good surface finish, and it is virtually impossible to single out any individual factor as being the most important.

If this were possible, however, most men familiar with the diecasting method of fabrication would specify die temperature, i. e., maintaining the die hot enough to eliminate chills and run marks but cold enough to prevent heat pits and blisters.

Although the importance of proper die temperature cannot be over-emphasized, other factors such as alloy composition, alloy temperature, injection pressure, surface finish of the die, method of gating and venting the die, etc., contribute not only to the surface finish but also to the physical and mechanical properties of the casting.

A diecasting-machine operator or an inspector of diecastings has no means of evaluating the quality of a diecasting other than by surface appearance.

Alloy Composition

There are three common zinc-base diecasting alloys in commercial use at the present time. These are known as the No. 2, 3, and 5 alloys (also designated as A. S. T. M. 21, 23, and 25; S. A. E. 921, 903, and 925).

The specifications for each of these alloys is shown in Table I.

It will be noted that the actual alloying elements are aluminum, copper, and magnesium. Other elements are impurities and as such must be maintained below the specified maximum quantities in order that optimum physical and mechanical properties be obtained both in the as-cast and aged condition.

Most diecasters today have standardized upon the No. 3 alloy which possesses excellent castability, dimensional stability, and good physical and mechanical properties.

A common complaint heard in most diecasting plants the moment an operator has trouble producing satisfactory castings from either an old or a new die, or when difficulty is experienced in either machining or trimming castings, is that "the metal is no good". Actually, off-grade alloy can be responsible for such difficulty in rare cases only, and these are enumerated as follows:

1. Low aluminum content (1.5–2.0 per cent) ad-

TABLE I. PERCENTAGE COMPOSITION OF ZINC BASE DIECASTING ALLOYS

	Alloy No. 2	Alloy No. 3	Alloy No. 5
Aluminum	3.5–4.5	3.5–4.3	3.5–4.3
Copper	2.5–3.5	.10 Max.	.75–1.25
Magnesium	.02–.10	.03–.08	.03–.08
Iron, Max.	.100	.100	.100
Lead, Max.	.007	.007	.007
Cadmium, Max.	.005	.005	.005
Tin, Max.	.005	.005	.005
Zinc	Remainder	Remainder	Remainder

* Formerly, Vice-President, Gerity-Michigan Corporation, now on loan to the ECA

versely affects fluidity or castability, and difficulty will be experienced in satisfactorily producing thin-walled castings of complicated shape.

2. High aluminum content (4.6–5.5 per cent) adversely affects impact strength, and castings produced from such alloy are likely to be brittle and may crack during any subsequent forming or straightening operation.
3. High copper content (3.75 per cent or higher) makes the alloy sluggish, and difficulty will be experienced in making thin-walled castings of complicated shape.
4. High magnesium content (0.05 per cent or higher) promotes hot shortness. This condition leads to cracking of the casting in the die prior to ejection. However, such cracking is generally confined to castings of complicated shapes that are not free to shrink in the die.
5. High lead, cadmium, and tin contents (about 0.01 per cent or higher) all promote hot shortness in much the same manner as high magnesium content.

Although it is recognized that the alloy composition must be maintained within the range specified to obtain satisfactory physical and mechanical properties, it should be remembered that it is possible to produce excellent-looking diecastings with inferior properties with off-grade alloy, providing such alloy is not beyond specification sufficiently to produce cracking in the die. The only positive check on composition is chemical or spectrographic analysis.

Alloy Temperature

Castings with good surface finish can be produced with alloy temperatures anywhere between about 740 and 850° F (393 and 454° C), providing, of course, that the proper die temperature is maintained by running more or less water through the die, depending upon the temperature of the alloy being injected, or "shot into the die".

The rate of heat withdrawal must be nearly equal to the rate of heat input in order to maintain a uniform die temperature during a casting cycle. Such a condition is only obtained with a constant metal temperature, steady rate of operation, and a given volume of water passing through the die.

Since it takes a longer period of time to cool a casting formed at a high alloy temperature, a condition that naturally decreases the rate at which castings can be produced, most diecasting operators prefer to operate at the lowest practicable alloy temperature. Furthermore, actual tests have shown that diecastings produced from alloy maintained at 825° F (440° C) or higher have inferior physical properties and that such hot metal attacks the iron pots, goosenecks, plungers, and spacers at a very rapid rate. Good diecasting practice calls for the use of the lowest practicable alloy temperature which, according to practical experience, is about 760–780° F (404–415° C).

Gating and Venting of the Die

Proper gating and venting of the die is a very important factor in the production of good castings. It is impossible to cover all phases of gating and venting, since this would require a small book in itself, but a few of the more important things to know and watch for are listed as follows:

1. *Size or Thickness of Gate Opening.* This is usually dictated by past experience, size of casting, shape of casting, type of finish required, and other factors. However, if an operator finds that, while running a certain job, good finish is only obtained by maintaining the die so very hot that heat pits and sometimes blisters occur, this is a good indication that a bigger or thicker gate opening is needed.

Another fundamental fault usually associated with a small or thin gate—particularly on a casting that must have a surface finish suitable for plating—is that the die is likely to solder near the gate, or hot portion of the die. Soldering is merely a condition where the metal actually builds up upon the die surface through alloying with the die steel. This condition leaves depressions on the casting that in many cases cannot be removed even by polishing or oiling.

The biggest advantage of a large gate opening is that it permits the metal to flow rather than spray into the die, a condition which not only makes for sounder castings but also permits good finish to be obtained at a lower die temperature.

The biggest disadvantage of a large gate opening is that the casting is difficult to trim and in some cases, holes or "breakouts" may be left when the gate is trimmed or broken off by hand.

By a small gate is meant an opening of about 0.025–0.03 inch (0.64–0.76 mm), whereas by a large gate is meant an opening of about 0.04 inch (1.0 mm) or larger, depending upon the section thickness of the casting in question. On certain large grille castings, gate openings of 0.08–0.09 inch (2.0–2.3 mm) are not uncommon, and the general practice today is to use gate openings of 0.04–0.06 inch (1.0–1.5 mm) whenever possible.

2. *Location of Gate Opening.* The gate opening is usually placed so that the metal flow takes place in one direction with the minimum interference from cores and other obstructions. If during a production run on a certain casting an operator notices that a bad surface condition is constantly obtained in a particular area—and this poor surface condition can be blisters, swirls, or chills—it may be an indication that the gate location should be altered slightly. In some cases the trouble can be eliminated without altering gate location by merely providing more venting or overflow wells.

3. *Venting and Use of Overflow Wells.* All dies must be properly vented, i. e., adequate means must be provided for the escape of the air in the casting cavity prior to its being filled with alloy. If adequate escape channels or vents are not furnished, air will be trapped

in the casting, and is very likely to produce blisters in thin-wall castings or porous castings with inferior properties.

Venting is usually accomplished by the use of channels about 0.004–0.005 inch (0.1–0.13 mm) thick placed at the parting of the die in positions likely to entrap air. In addition to the use of vents, advanced die design calls for overflow wells, or draw pockets, which are merely additional small cavities strategically placed around the casting cavity proper, not only to provide an exit for the air from the casting cavity, but also to draw or bleed metal around a corner or core and to help maintain the uniform die temperature so necessary for the production of good surface finish.

If an operator notices that a casting develops blisters—particularly when the die is cold or at least not up to the temperature where good surface finish is produced—it is a good indication that more venting and possibly overflow wells are needed. A temporary check would be to run the die with more flash by shimming or other means.

As mentioned before, swirls or porous areas (frequently confused with chills) can often be eliminated by more venting or the use of overflow wells, especially if such defects occur at a great distance from the gate or near a core or other obstruction in the die.

4. *Gate Runner Design.* This is equally as important as size and location of the gate opening. Proper gate-runner design is based upon experience and cannot be easily explained. The best gate runner is one that permits a decrease in velocity and the development of higher and more uniform pressure at the gate opening.

Metal Injection Pressure

Fundamental studies on the effect of injection pressures upon the physical properties and soundness of zinc-alloy diecastings have shown that there is little advantage to be gained from the use of pressures in excess of about 1000–1600 psi (70–110 kg/cm²).

However, the present-day tendency is toward the use of somewhat higher pressures (1500–3000 psi; 105-210 kg/cm²) for certain castings of peculiar shape or size where higher pressure will be helpful in filling the cavity and producing better surface finish.

Statements about correct injection pressure, of course, assume proper plunger fit to obtain the pressure theoretically expected from a certain size plunger and a given plunger-actuating force. A loose-fitting plunger can often be the direct cause of failure to produce good diecastings, since there will be insufficient pressure to pack the alloy solidly in the cavity and to hold the alloy firmly against the die surface.

Equally important as proper injection pressure is proper combination of plunger and gooseneck cylinder size to obtain a sufficient volume of alloy to fill the casting cavity, gate runners, overflow wells, sprue, nozzle, etc., and still secure proper plunger travel. Gooseneck size should be selected so as to achieve maximum packing pressure when the plunger has travelled half a stroke or more.

All of this sums up to the need for proper injection pressure on the alloy, and all factors affecting this pressure must be controlled in order to obtain diecastings with good surface finish and satisfactory physical properties.

Surface Finish of the Die

The degree of polish or surface smoothness of a die cavity is directly related to the surface smoothness of a casting produced therein. A highly polished die cavity will produce a casting with a surface finish superior to that obtained from a poorly polished die cavity.

It is also important to have smooth gate-runner cavities. These need not have the same degree of surface smoothness as the die cavity but should be smooth enough to avoid causing unnecessary turbulence in the alloy prior to its injection into the die cavity.

In this connection, the use of die coatings such as potassium bromide, or lubricants such as oils, grease, and waxes, should be avoided, particularly on the cover half of the die. Die coatings actually leave an insulating layer on the surface of the die which prevents proper chill or heat withdrawal by the die and merely masks the underlying poor surface which is exposed by subsequent buffing.

Lubricants in general act similarly but have less of a masking effect. In fact, some lubricants will actually spoil or prevent good finish until removed by subsequent "shots". Also, the continued use of certain lubricants will leave a carbonized or burnt deposit on the die which must be removed by "stoning" or other mechanical means before good finish can be obtained.

There are instances, however, when a drag or slight undercut develops on a die during production and when a machine operator, to avoid immediate stoppage for repairs, will find the use of a die coating or lubricant very helpful in maintaining production until proper die correction can be made.

In these special cases, the use of die coatings or lubricants should be restricted—if at all possible—to the back or ejector portion of the die. If a drag or undercut must be treated on the front or cover portion of the die, then it is better to use a lubricant than a coating material. The best type of lubricant to use in such instances is one which leaves little or no carbon residue and has good heat-resistant qualities.

A safe maxium for best surface finish is "use a highly polished die and no die coatings".

Die Temperature

Probably the most important factor influencing the production of diecastings with good surface finish is the maintanence of proper die temperature. By proper die temperature is meant the lowest possible temperature at which all chills and run marks are eliminated.

Because diecasting dies may vary in size from less than a square foot in area to as much as 20 or even 30 sq.ft (186 or 279 sq.dm), proper die temperature is

not a single value but an average value with a difference of as much as 50° F (28° C) between the hottest and the coolest portions.

On the basis of observations made in many diecasting plants over a period of several years, it is apparent that good finish can usually be obtained with die temperatures in the range of 300–400° F (149–204° C). If a die must be maintained at a temperature much in excess of this range to obtain good finish, there is good reason to believe that die design—the size and location of the gate, gate-runner design, use of overflow wells, etc.,—is at fault and that steps should be taken to correct it.

Dies should be kept at the lowest possible temperature that yields good finish, because

1. The primary objective of the diecasting process is to produce a casting by rapid chilling, a procedure which yields castings with a highly refined grain structure and best physical properties.

2. Thin-wall castings containing entrapped air (even the best diecastings contain some entrapped air) are less likely to blister.

3. There is less tendency for the dies to solder, burn, pit or heat check.

4. General die maintenance is reduced since core and ejector pin lubricants are better able to retain their lubricating qualities and have less tendency to carbonize.

Many factors influence die temperature, and some of these have already been discussed, but the most important are the amount of cooling provided, the rate of operation or number of "shots" being made per hour, and the temperature of the metal or alloy being injected into the die. For example, when a machine is operated with a die that produces a casting weighing one pound, every time this amount of alloy—and usually more to provide for the sprue, gate, gate runners, and overflow wells—is injected into the die at a given temperature, a certain quantity of heat must be withdrawn from the mass of hot alloy by the die in order to chill or freeze the alloy into a solid casting.

If no cooling were provided on the die it would soon attain a temperature approaching that of the alloy and provide little or no chilling effect, so that a considerable length of time would be required before the casting would become solid and cold enough to be ejected from the die. For this reason and others, all diecasting dies are provided with drilled channels through which water, steam, or air may be passed in controlled quantities to prevent overheating. Furthermore, cooling channels are usually provided in both halves of a die at positions most likely to require greatest cooling, such as the sprue cover, sprue pin, gate and gate runners. In many instances cooling channels are also provided at certain specific locations, some distance from the gate, to cool a spot or area over a heavy boss or lug for prevention of sink spots or shrinkage areas.

In general, it is better to provide more cooling channels than may be needed than to lack the necessary means of controlling the die temperature over the entire area of the die, both in the cover and the ejector portions of the die.

It is also necessary in many cases to provide cooling of cores around which thick sections are to be cast if high production rates are desired. Such cores are often cooled by an external air blast.

Rate of operation, or the number of "shots" being made per hour on a machine, also directly affects die temperature, since with a high rate of operation, greater cooling must be provided for the die than is necessary with a low rate of operation. Therefore, if the rate of operation is reduced because of machine trouble or other cause, the amount of cooling on the die should be reduced accordingly. This is particularly true during a complete shutdown for lunch period, when cooling of the die should be stopped entirely to avoid excessive chilling of the die and consequent loss of valuable production time to bring the die to proper operating temperature.

The temperature of the alloy being injected, or "shot", into the die also affects die temperature but not so much as is commonly believed. It is merely necessary to adjust the amount of cooling on the die to conditions under which the machine is being operated. It is more important to maintain metal temperature within a fairly narrow range in order to avoid frequent die-cooling adjustment.

Miscellaneous

There are many little things that must be watched while operating a diecasting machine. These in themselves may seem small and unimportant, but all contribute to successful operation and thus indirectly to the production of good castings. A few of them are discussed below.

1. *Removal of Skimmings.* The gooseneck and melting pot of a diecasting machine are made of cast iron, and both are subject to continuous attack by molten zinc alloy. The nature of this attack is such that when any iron has dissolved it immediately combines with aluminum in the alloy and forms a hard, brittle, intermetallic compound—$FeAl_3$. This compound has a lower specific gravity than the zinc alloy and levitates to the surface and constitutes the bulk of the skimmings ordinarily seen on the surface of the alloy in the melting pot of a diecasting machine. These skimmings, or particles of iron-aluminum compound, must be removed frequently to avoid the danger of their being injected into the die along with good alloy and producing hard spots in the casting.

The rate of formation of iron-aluminum compound varies directly with the temperature of the alloy. Therefore, to minimize the formation of skimmings, alloy temperature must be maintained at 800° F (427° C) or lower.

2. *Quenching.* Many diecastings are quenched or cooled in water immediately upon removal from the

(*Continued on page 953*)

leaders
in the
industry xxvii

William M. Tucker

WILLIAM M. TUCKER, like several of his predecessors on this page, is a small-town boy who has made good. He was born on June 13, 1903 in West Union in southwestern Ohio and attended grade and high schools in Winchester, Ohio. There followed studies of chemical engineering at Ohio State University in Columbus, from which he graduated with a B.Ch.E. degree in 1930. After another year he had earned a M.S.&Ch.E. degree from the same school.

Although it was a depression year, armed with memberships in Tau Beta Pi, Sigma Xi, and Phi Lambda Upsilon, honorary engineering, scientific and chemical societies, Mr. Tucker soon obtained employment with the Eastman Kodak Company in Rochester, N. Y., and has been with that company ever since. The first one and one-half year was spent in paper making at the paper mill of the Kodak Park Works. He then dealt with nitration for one-half year and especially with corrosion problems encountered in the process. This whetted his appetite for general corrosion work, which, with electroplating and other finishing of metals, was soon to take all his time.

Several papers have been published as a result of his electroplating work, among them one on heavy-nickel plating solutions and techniques and one (with R. F. Flint) on the preparation of copper, nickel and steel for chromium plating, which is on its way to become a classic. No publications have emerged from his other work, largely because of its secret nature.

Mr. Tucker is perhaps best known in the electroplating industry through the leading role he has played in the Research Committee of the American Electroplaters' Society. In 1947 he was made Vice-Chairman in charge of Projects Nos. 4 and 7 and in 1948 Chairman of its Research Directing Subcommittee, and during the year 1949–1950 he served as chairman of the main Committee. At the recent Boston Convention of the Society Mr. Tucker received its Award of Merit in recognition of the work done for the Society and the industry. He is also a member of the Electrochemical Society and American Chemical Society.

Married in 1938 to Ruby M. Thompson, Mr. Tucker now lives with wife and two sons, Ted, 9, and Lee, 4, at Ridge Road West, Rochester. This is the main road to Niagara Falls, known to the old timers and the Tuckers as Honeymoon Trail. Here a suppressed desire to own and operate a farm has taken the form of gardening on a three-fourths-acre plot of ground, an exercise which has entirely displaced his former hobby of tennis playing. His particular interest is in the growing of fruit trees, "compatible with the Rochester climate", as Mr. Tucker sadly adds. Another old hobby, salon photography, he confesses, has degenerated into chronological recording of the growth and development of his boys, through whose influence he recently became chairman of the local cub scout committee. Finally, he is struggling with a new hobby, cabinet making, which he finds producing amazingly disappointing results.

Determination of Free Cyanide and Ammonia in Brass and Bronze Plating Baths

Part III. Experimental Evaluation of Present Methods and Recommended Procedure for Ammonia Determination

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Introduction

Copper-zinc alloys are widely plated today (1) to give the appearance of brass or bronze where color is the primary consideration and composition is incidental and (2) to facilitate the adhesion of rubber to steel where composition is fairly critical and kept between 25 and 33 per cent zinc and the color is incidental.

Ammonia is an important constituent of brass baths and indeed has been used for nearly 100 years[1]. The recommended concentrations of ammonia in several brass baths are given in Table I.

The profound effects and importance of ammonia additions to a brass plating solution has been demonstrated by several investigators, notably Pan[2,3], Hogaboom[4], Clarke[5], and Graham [6,7]. In the absence of ammonia, the composition of the brass deposits is very dependent upon the copper:zinc ratio in the bath and upon the cathode current density. The operating conditions of the bath are therefore very critical, inasmuch as the deposit changes considerably with slight alterations in these conditions. The color of the deposits is also poor and varies with current density.

The presence of ammonia in the bath greatly minimizes these effects[2,3]. The color is much improved, and the composition of the deposit is maintained much more nearly uniform over a wide range of current densities and copper:zinc ratios. More consistent plating is thereby obtained in regard to appearance and composition.

These effects of ammonia are believed to result from changes in the copper and zinc complexes. Pan[2] postulated the formation of a copper ammonia complex having a lower ionization constant than $Na_2Cu(CN)_3$. Buchan[8,9] suggested that the ammonia in solution counterbalances cathodic polarization, presumably by acting as a current carrier. In confirmation of this, Buchan found experimentally that the ammonia concentration in the cathode film was less than in the main body of the solution and decreased with increase in current density.

The addition of ammonia increases the zinc content of the deposit considerably[2,5]. Ferguson and Sturdevant[10] observed that ammonia increased the potential necessary to deposit both copper and zinc, indicating a decrease in the ion concentration of both metals.

TABLE I. AMMONIA CONTENT* OF SEVERAL BRASS BATHS GIVEN IN THE LITERATURE

Reference			Ammonia	
Author	Year	No.	g/l NH_3	ml 28% NH_4OH/gal
Pan	1938	2, 3	0.2 –1.5	3.0–22.5
Meyers	1938	16	0.31†	4.7
Clarke	1944	5	0.5 –2.0	7.5–30.0
Hayford and Rogers	1945	18	2.25	33.7
Hogaboom and Hall	1949	17	0.31†	4.7
Graham	1949	6	1.33–3.33	19.7–50.0
Graham	1948	7‡	0.25–1.25	3.8–18.8

*This is the amount added to a fresh bath. The value maintained during operation is not given in most cases, probably because of lack of or uncertainties in analytical control.
†Platers will recognize more readily the equivalent figure of 1 pint of 28% NH_4OH per 100 gallons.
‡This reference is to "bronze" plating solutions.

Numerically the potential of copper, however, was found to increase faster than that of zinc, and this contributed toward a reduction in the amount of copper codeposited with the zinc.

The presence of ammonia in a brass bath increases the cathode efficiency[2,5]. Soderberg[11] suggested that both the increased efficiency and the increase in the zinc content of the deposit are due to the effect of ammonia in selectively increasing the efficiency of deposition of the zinc constituent.

Ammonia also increases throwing power of the brass solution and decreases the occurrence of "burning"[9].

In the past, ammonia has not been added to conventional "bronze" baths. Graham[7] found that the addition of 0.25–1.33 g/l NH_3 was required to adjust the color of the deposit in his high-concentration, high-speed "bronze" plating bath, which yields uniform color over wide ranges of current density and temperature. The ammonia was also found to increase the zinc content of these deposits, as well as the cathode efficiency.

The effects of ammonia in brass solutions are summarized in Table II. It is obvious that more research is necessary to determine the chemistry of these solutions and to explain the aforesaid effects.

A brass bath to which no ammonia has been added, either in the makeup or for maintenance, will reach an equilibrium value of ammonia content during regular operation. Ammonia is formed during makeup from the decomposition of cyanide by the heat of reaction; the amount of ammonia formed is proportional to the zinc content of the bath[6]. Ammonia is also formed by further decomposition of the cyanide bath on standing[12] and by electrolysis. Some ammonia is lost by volatilization[6] and swept out of the solution by evolved hydrogen[5]. An equilibrium value of 0.21 g/l NH_3 was reported in one bath under typical operating conditions[13]. This value, however, is too low for maximum benefit, and it is general practice today to make frequent small additions of ammonia to the brass bath[14].

TABLE II. EFFECTS OF AMMONIA IN BRASS PLATING BATHS

	Reference
On Properties of the Solution	
1. Decreases metal-ion concentration	10
2. Increases deposition potential of copper and zinc	10
3. Increases throwing power	9
4. Increases tendency for sludging	6
On Composition and Properties of the Deposit	
1. Stabilizes color of the deposit	2,5
2. Minimizes effect of current density	2
3. Minimizes effect of copper: zinc ratio in solution	2
4. Increases percentage of zinc	2, 5
5. Increases cathode efficiency	2, 5
6. Decreases "burning"	

The need for accurate control of the ammonia content of a brass bath both to maintain color and the composition of the deposit is obvious.

The purpose of this paper was to evaluate the analytical methods reported in the literature and to recommend a preferred method. None of the methods is generally accepted. Furthermore, the methods yield different results on a given bath, so that a reported value for ammonia has significance only if the method is given. This situation is intolerable, especially since ammonia content, in contrast to free cyanide content, has only one meaning and true value.

Review of Published Methods

Ammonia, present alone in aqueous solution or as simple ammonium salts, may be determined quantitatively by the standard evolution method, i.e., by distilling the sample in the presence of excess sodium hydroxide and collecting the evolved ammonia in standard acid solution. The difficulty in the analysis of ammonia in brass baths results from the interference by the other nitrogen compounds, such as the free sodium cyanide, which are present. In a fresh brass bath, for example, the free sodium cyanide decomposes slowly during the sodium hydroxide boil yielding ammonia[19]; consequently, high results are obtained by the simple evolution method:

$$NaCN + 2H_2O \xrightarrow{NaOH} HCOONa + NH_3$$

(HCOONa: sodium formate)

The various methods in the literature endeavor to eliminate the interference by cyanides, etc., during the evolution:

1. According to the method recommended by Heiman and McNabb[20] the cyanides present in the brass bath are destroyed by a hydrochloric acid boil. This incidentally allows the total sodium cyanide in the brass bath to be determined if so desired. The ammonia is then determined in the residue by the evolution method described above. In experiments with freshly prepared brass baths, the results were excellent; the recovery of ammonia was about 1 per cent too high and the total cyanide about 1 per cent too low. This was believed to be due to some hydrolysis of the hydrogen cyanide to ammonium formate during the acid distillation[25].

2. Monaweck[12] applied the above procedure to electrolyzed solutions and obtained high results. In order to overcome the error, he recommended the following procedure: sulfuric acid is added to a sample of brass solution, the cuprous cyanide filtered off, and the hydrogen cyanide in the filtrate removed by evaporation. The ammonia is then determined in the residue by the standard evolution method. This method was studied intensively by Clarke[5] and Blow[21] and subjected to much criticism.

In the discussion of Monaweck's paper, Coats[22]

pointed out that while the Heiman-McNabb method was quantitative for fresh brass baths, it gave high results with an old bath due to the interference of sodium cyanate: the cyanate is converted into ammonium salt during the hydrochloric acid boil and recovered as ammonia during the evolution. Since this material may be present in relatively large amounts in an electrolyzed bath, the error may be serious.

The sodium cyanate, and possibly other compounds, forms in an old brass bath, or indeed in any cyanide plating solution, in two ways: (1) oxidation of cyanide at the anode, especially if insoluble or polarized anodes are used[21,23], and (2) oxidation of cyanide by air[19]. The cyanate is an intermediate product and decomposes ultimately into sodium carbonate and ammonia[15]. However, equilibrium amounts of cyanate and other decomposition products are always present in an old brass bath. They apparently have little or no effect on the brass deposit[24].

3. Clarke, Bradshaw and Longhurst[5] described a method which consists in precipitation of all the cyanides with silver nitrate in an acidified sample. After filtration, sodium hydroxide is added to the filtrate and the ammonia determined by the standard evolution method. Sodium cyanate does not interfere in this method as it is removed by precipitation as silver cyanate.

The detailed procedure is as follows: a 25-ml sample is acidified to litmus with acetic acid and diluted to about 100 ml. Silver nitrate solution (10 per cent) is added with stirring until no further precipitate is formed. The liquid is filtered into the distilling flash of the usual Kjeldahl ammonia-distillation apparatus. Ten grams of solid sodium hydroxide are added and the ammonia distilled into 50 ml of 0.1-*N* hydrochloric acid, which is then back-titrated with 0.1-*N* sodium hydroxide using methyl red as indicator. 1 ml of 0.1-*N* hydrochloric acid = 0.0017 g NH_3.

The results with this method are good. Even so, Blow found that while the silver nitrate removes the cyanate it does not remove other nitrogeneous decomposition products which decompose further during the sodium hydroxide boil and give slightly high values for ammonia. With a correction, however, the Clarke method will yield a true quantitative value for the ammonia content of an electrolyzed bath. The correction consists in plotting the amount of distilled ammonia as a function of time and projecting the curve back to zero time of distillation. Details are given in the reference cited. While the experimental techniques in this method are elementary, the processes of precipitation, filtration and washing are time-consuming.

4. Blow, Hiscox and Smith[21] devised an ingenious method for determining ammonia in electrolyzed brass baths. The results are quantitative; the procedure is relatively simple and takes the least time of all the methods investigated. On the basis of the published results and the present authors' evaluation, this procedure is recommended.

The method is based on the different rates at which ammonia is evolved from the several nitrogen compounds in a brass bath during distillation with sodium hydroxide solution. The nitrogen compounds are (1) ammonia, (2) sodium cyanide, and (3) cyanide decomposition products. Ammonia from the aqua ammonia or simple ammonium salts already present in the bath is evolved rapidly: it is completely distilled over in about ten minutes. The ammonia from the decomposition of sodium cyanide, sodium cyanate, etc., on the contrary, forms and evolves very slowly in direct proportion to the time of boil and is incompletely removed even in thirty minutes.

The principle is illustrated in Fig. 1. Samples of (a) sodium cyanide, (b) ammonium chloride, and (c) a mixture of the two were distilled with 10 per cent sodium hydroxide in a standard Kjeldahl apparatus and the amount of ammonia evolved determined at periodic intervals of time with 0.1-*N* hydrochloric acid. (For details of the determination see "Procedure for Free Ammonia" in the next section.)

In curve (a), the sample was 10 ml of a solution containing 35.0 g/l cp sodium cyanide. The decomposition, as measured by the ammonia evolved, proceeded slowly and at a constant rate; after twenty minutes, for example, only 5.3 per cent had decomposed into ammonia.

In curve (b), the sample consisted of 10-ml of an ammonium chloride solution containing the equivalent of 1.83 g/l NH_3, a value reached in 10 minutes.

In curve (c), the sample contained both sodium cyanide and ammonium chloride in exactly the same amounts as in tests (a) and (b). During the steep part of the curve, ammonia evolved from both. After about ten minutes when all the ammonia from the ammonium chloride had been recovered, the slope of the curve corresponded to the rate of decomposition of the sodium cyanide alone (curve a). By extending

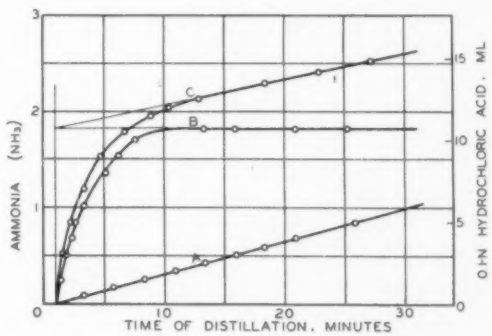

Fig. 1. Determination of "free ammonia" by the Blow method in (A) sodium cyanide solution containing 35.0 g/l cp NaCN, (B) ammonium chloride solution containing 5.76 g/l NH_4Cl (equivalent to 1.83 g/l NH_3), and (C) composite solution containing 35.0 g/l cp NaCN and 5.76 g/l NH_4Cl

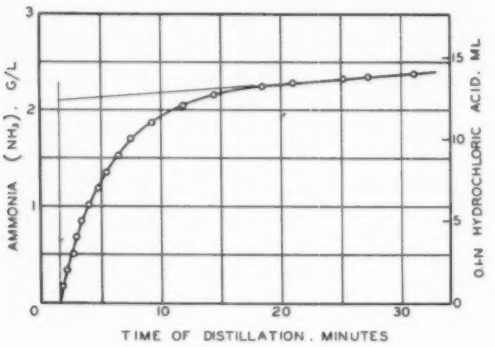

Fig. 2. Determination of "free ammonia" by the Blow method in a fresh brass bath containing 31.5 g/l CuCN, 11.5 g/l $Zn(CN)_2$, 50.5 g/l NaCN, 30.0 g/l Na_2CO_3, and 6.30 g/l NH_4Cl (equivalent to 2.00 g/l NH_3)

the straight line back to the time at which ammonia begins to reach the receiver (one minute in Fig. 1) the ammonia evolved from the sodium cyanide during the entire course of the distillation may be eliminated, leaving only the ammonia recovered from the ammonium chloride.

Fig. 2 shows the distillation curve for a commercial brass plating solution, as well as the lines drawn to determine "free ammonia".

Blow and coworkers also developed a method for determining the nitrogenous cyanide decomposition products (expressed in terms of equivalent ammonia) in an electrolyzed brass bath. These substances which Blow called "noncyanide nitrogen compounds" may be cyanates, urea, complex ammonium compounds, etc., although no attempt has yet been made to identify them. The term "total noncyanide nitrogen" includes both the "noncyanide nitrogen" and the "free ammonia", and both are expressed in g/l NH_3.

An estimation of these decomposition products gives

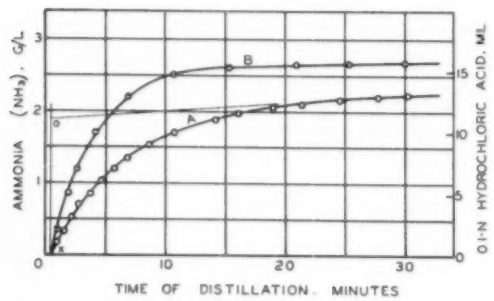

Fig. 3. Determinations of (A) "free ammonia" and (B) "total noncyanide nitrogen" in a commercial brass plating solution (bath C in Table IV)

useful information about the working condition and the extent of ageing of the brass bath, and indeed of all cyanide baths. It may also be of value in tracing the course of the decomposition of cyanides in the electrolytic method for destruction of cyanide wastes[36].

The general procedure for the determination of the cyanide decomposition products is as follows:

1. Remove the cyanides from the sample of brass solution by a hydrochloric acid boil.
2. Boil the residue with sulfuric acid to complete the conversion of the nitrogenous decomposition products into simple ammonium salts.
3. Add sodium hydroxide in excess and distill off the ammonia. This gives the "total noncyanide nitrogen" expressed as ammonia.
4. Determine the "free ammonia" in a separate sample as described above.
5. The cyanide decomposition products expressed as g/l NH_3 equals the "total noncyanide nitrogen" in g/l NH_3 minus the "free ammonia".

A typical distillation curve obtained in the determination of the "total noncyanide nitrogen" in a commercial brass plating bath is given in Fig. 3.

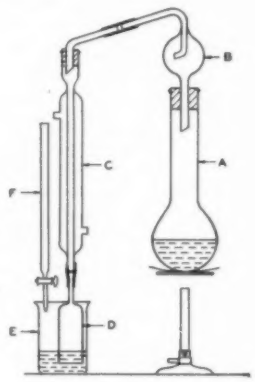

Fig. 4. Distillation apparatus. (A) 500-ml long-necked Kjeldahl flask, (B) Kjeldahl connecting bulb, (C) condenser, (D) filter tube, (E) 300-ml tall-form beaker, (F) 25-ml burette

Details of Blow's Method

The equipment consists of a standard Kjeldahl distillation apparatus (Fig. 4). A funnel is attached to the condenser to prevent acid from being sucked up the condenser during the test. The use of a separatory funnel for adding the sodium hydroxide solution is optional inasmuch as no ammonia is evolved until the solution starts to boil. Any suitable time piece may be used for measuring the time of distillation; the present authors found a G. E. Interval Timer satisfactory.

Procedure for "Free Ammonia"

1. To the distillation flask add a 10-ml sample of the brass bath, 250 ml distilled water, and a few porous chips.
2. In the receiving beaker place 100 ml distilled water and three drops of methyl red indicator.

TABLE III. TYPICAL RECORD OF DATA TAKEN DURING A DETERMINATION OF "FREE AMMONIA" IN A COMMERCIAL BRASS PLATING SOLUTION BY THE BLOW PROCEDURE
Data plotted in Fig. 3

Time, minutes	0	1.0	1.6	2.3	2.8	3.8	4.7	5.8	6.9
0.1-*N* HCl, ml	.....	1.0	2.0	3.1	4.0	5.0	6.0	7.0	8.0
NH_3, g/l	.....	0.17	0.34	0.53	0.69	0.85	1.02	1.20	1.36
Time, minutes	8.7	10.8	14.2	16.1	19.0	21.4	24.6	27.8	30.3
0.1-*N* HCl, ml	9.0	10.0	11.0	11.5	12.0	12.35	12.7	13.0	13.2
NH_3, g/l	1.53	1.71	1.88	1.95	2.04	2.10	2.16	2.21	2.24

3. Fill a burette with 0.1-*N* hydrochloric acid. Run 1.0 ml into the receiving beaker from the burette.
4. Add about 25 ml of 10 per cent sodium hydroxide to the distillation flask.
5. Heat the flask with a full flame and keep the gas flame constant during the determination to insure a uniform rate of distillation. The time at which the solution begins to boil is noted and recorded as zero time. Ammonia begins to evolve at this point and appears in the receiver about 1–2 minutes later.
6. Each time when the indicator in the beaker changes color, note the time within a 0.1 minute and then run in an additional 1.0 ml of acid from the burette. Stir the solution in the beaker frequently with the funnel.
7. Continue this procedure for about ten minutes and then reduce the additions of acid to 0.5 ml for a second ten-minute period. During the third and last ten-minute period the additions of acid should be 0.2 ml*.

Typical results on a commercial brass bath (Bath C, Table IV) are given in Table III and plotted in Fig. 3.

In routine control work only the ml of 0.1-*N* hydrochloric acid need be plotted against the time of distillation. The number of milliliters corresponding to the extrapolated result may then be converted to g/l NH_3. (NH_3 in g/l equals the number of ml of 0.1-*N* HCl times 0.17.)

The "free ammonia" is obtained as follows: the first part of the curve is continued downwards to the line of zero-ml acid. A vertical line is erected at this point. The sloping straight line of the latter part of the curve is continued to the left to meet the vertical line. The point of intersection gives the "free ammonia" content of the brass bath in g/l NH_3 (1.88 in Fig. 3).

The technique of the method is easily acquired, and the results are reproducible within 0.02 g/l NH_3. The points at the beginning and the end of the distillation are the most important. Any errors in a few points are readily recognized and do not affect the final result.

Procedure for Cyanide Decomposition Products

1. To the distillation flask add a 10-ml sample of the brass bath, 50 ml distilled water, and a few porous chips.
2. In the receiving beaker, place 25 ml of 10 per cent sodium hydroxide and 75 ml water.
3. Add to the distillation flask 12 ml concentrated hydrochloric acid diluted to 60 ml and boil for about 20 minutes.
4. If the total sodium cyanide content of the bath is desired, titrate the solution in the receiving beaker with 0.1-*N* silver nitrate using 6 ml ammoniacal potassium iodide indicator (42 ml conc. NH_4OH plus 3.3 g/KI per 100 ml solution). The end point is a bluish opalescence. The total sodium cyanide in g/l equals the number of ml of 0.1-*N* silver nitrate times 0.98.
5. Cool the residue in the distillation flask, add 15 ml of concentrated sulfuric acid, and boil carefor another 20 minutes.
6. Allow the flask to cool.
7. Use another receiving beaker and add to it 100 ml of a 4 per cent solution of boric acid.
8. To the distillation flask add 250 ml distilled water and 80 ml 50 per cent sodium hydroxide.
9. Boil the solution for 15 minutes.
10. Titrate the solution in the receiving beaker with 0.1-*N* hydrochloric acid using methyl red as indicator.
11. The "total noncyanide nitrogen" expressed as g/l NH_3 equals the number of ml of 0.1-*N* hydrochloric acid times 0.17. The nitrogenous cyanide decomposition products expressed in equivalent g/l NH_3, therefore, equals the "total noncyanide nitrogen" minus the "free ammonia".

*The volumes of the hydrochloric acid additions and the time of test may differ depending on the solution used and on the judgment of the operator. The important thing is to get sufficient points in the beginning of the run to permit accurate extrapolation of the time for beginning distillation and at the end of the run to draw an accurate straight line which will cross the vertical line from the time for beginning distillation.

TABLE IV. AMMONIA CONTENT OF THREE BRASS PLATING SOLUTIONS DETERMINED BY FOUR METHODS

Method	Ammonia Content in g/l NH_3 in			
	Fresh Bath A*		Electrolyzed Commercial Bath B†	Electrolyzed Commercial Bath C‡
	As Is	With 2 g/l NH_3		
1. Heiman-McNabb	0.11	2.14	0.66	2.38
2. Monaweck	....	2.17	0.73	2.54
3. Clarke	0.09	2.12	0.41	1.97
4. Blow	¶	2.11	0.32	1.89

*Same as Bath A of Part II of this series.

†The total noncyanide nitrogen of this bath was found to be equivalent to 0.76 g/l NH_3. The content of cyanide decomposition products expressed in equivalent g/l NH_3 therefore equals 0.76 − 0.32 = 0.44.

‡The total noncyanide nitrogen of this bath was equivalent to 2.68 g/l NH_3. Therefore, the cyanide decomposition products equal 2.68 − 1.89 = 0.78 g/l equivalent NH_3.

¶The Blow method is not reliable when the ammonia content is less than that normally present in commercial brass baths (see Table I).

Experimental

Three brass solutions, one freshly prepared and the others taken from commercial plating plants, were analyzed for ammonia by the four methods previously described. The results are given in Table IV.

The average of the values for the ammonia content in a freshly prepared brass bath by methods 1 and 3 was 0.10 g/l NH_3. This is comparable to the following values given in the literature: 0.03–0.16 g/l[5] and 0.07–0.16 g/l[21].

To this fresh bath, 2.0 g/l NH_3 was added as ammonium chloride. The values for the ammonia content of this solution obtained by the four methods were fairly close. This is because no cyanide decomposition products were present and because the evolution method, which is the basis of all the methods, determines ammonia or simple ammonium salts quantitatively. It is seen that the values obtained approximate 2.10 g/l NH_3, the sum of the 0.1 g/l ammonia present in the fresh bath and the 2.0 g/l added.

The results obtained by the four methods on the two electrolyzed commercial brass baths vary widely. The reasons have already been discussed. It is seen that the lowest values of ammonia are obtained by the Blow method, which is believed to give quantitative values for ammonia content. The results by method 3 are slightly higher due to conversion to ammonia of cyanide decomposition products other than sodium cyanate during the distillation with sodium hydroxide.

The results with methods 1 and 2 are still higher as a result of the conversion to ammonia of most of the decomposition products, mainly cyanate, during the acid boils.

Summary

Ammonia is an important constituent of brass plating baths and has considerable desirable effect upon the color and other properties of the deposits and on the operating characteristics of the bath.

There are several methods in the literature for determining ammonia in brass baths, but none is generally accepted. With a given freshly prepared brass bath, the values for ammonia content found by the several methods agree and are quantitative. However, with a given electrolyzed brass bath, the values are widely divergent. This is due to the interference of cyanide decomposition products, such as sodium cyanate, which leads to fictitiously high values for ammonia by some of the methods.

On the basis of the present authors' evaluation of the various methods the procedure developed by Blow is recommended as the preferred method. It gives quantitative results with electrolyzed brass solutions and is relatively easy to carry out. The method may also be extended to include the determination of the cyanide decomposition products expressed in g/l of equivalent ammonia. Details of these methods are given.

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(*Continued on page 953*)

GOLD PLATE - - - a subject for controversy

Among the useful occupations of the Federal Government is the promulgation of commercial Standards desired and accepted by the industry through one of its trade associations.

The purpose of such standards is to establish for specific commodities nationally recognized grades or consumer criteria. The signing of acceptance of a commercial standard by an organization or individual indicates an intention to follow it where practicable in the production, distribution, or consumption of the article in question. The U. S. Department of Commerce, which acts as the unbiased coordinator of industry interests and promulgates standards that it considers adequate, has no regulatory power in their enforcement. They are made effective through usage and through incorporation into sales contracts by means of labels, invoices, and the like.

A somewhat similar government activity is carried on by the Federal Trade Commission. Its Trade Practice Rules too are set up with the cooperation of industry. Once promulgated by the Commission, however, they have the force of law.

Federal Trade Commission Rules

Some time ago, Mr. Donald Wood of Hill-Cross Company brought to the attention of the Executive Board of the American Electroplaters' Society as being likely to have an adverse effect in the field of gold electroplating the Federal Trade Commission Trade Practice Rules for the Fountain Pen and Mechanical Pencil Industry promulgated October 11, 1949.

According to Rule 16, Section II, . . . "the word Gold, or abbreviation thereof, should not be used as descriptive of any such product or part—

"1. Unless such part is composed throughout of gold of 24-karat fineness; or

"2. Unless the part is composed throughout of gold alloy of not less than 10-karat fineness and the karat fineness thereof is shown in immediate conjunction with the word gold as for example, '14K Gold'; or

"3. Unless the part is mechanically plated with gold, or gold alloy of not less than 10-karat fineness, and the fact that the part is plated and the proportional weight and karat fineness of the plate are shown in a clear and nondeceptive manner in immediate conjunction with such word 'Gold' or its abbreviation set forth in conformity with the provisions of Commercial Standard CS47-34 relative to the marking of gold filled and rolled gold plate articles other than watch cases, as for example '1/20 14K Gold Filled', '1/20 14K G.F.', or '1/40 14K Rolled Gold Plate', or '1/40 14K R.G.P.'; or

"4. Unless where the part has a covering of gold or of gold alloy of not less than 10-karat fineness which has been applied by an electrolytic process or method and is of a minimum thickness throughout equivalent to seven-millionth (.000007) of an inch thickness of pure gold and the fact that the part is electroplated is shown in a clear and nondeceptive manner in immediate conjunction with the word 'Gold', or its abbreviation, as for example 'Gold Electroplated'. (Nothing in this rule shall be construed as prohibiting use of the word 'Gold' in the designation 'Gold Washed' or 'Gold Flashed' as descriptive of the products or parts which are electroplated with gold to a lesser thickness than the abovementioned seven-millionth (.000007) of an inch").

Comments by Donald Wood

Mr. Wood pointed out that (a) by implication the words "Gold Plate" may be used to mark only gold filled articles and not, as has been the custom, articles that are gold electroplated, (b) there is often not room to print legibly the words "Gold Electroplated", (c) about twice as much gold, 0.000007 inch, would have to be applied without sufficient change in quality to justify the added cost, (d) the minimum thickness of 0.000007 inch is so close to the maximum permitted without excise tax, 0.000010, inch as to be technically intolerable, and (e) in the foreign market a foreign manufacturer who can continue to use present markings may gain in competition with the American manufacturer who in many cases will have to use such markings as "Gold Flashed" or "Gold Colored".

The present "gold plater" will now become "gold electroplater", but only if the articles he plates happen to require or permit the application of 0.000007 inch of gold or more; if they do not, he is a "gold flasher" or "gold colorer".

Comments by G. R. Frankovich

At the request of the Executive Board, Dr. Edward A. Parker of Technic, Inc., consented to investigate the situation further. He began by contacting Mr. George R. Frankovich, Executive Secretary of the New England Manufacturng, Jewelers' and Silversmiths' Associatiion who kindly prepared a summary of the marking and stamping regulations and stipulations pertaining to gold-coated and karat-gold merchandise and an extract of pertinent tax regulations on items containing gold and on jewelry. We quote from this summary:

Marking and Stamping

"There are two principal commercial standards pertaining to the marking of jewelry items. They are:

"1. Commercial Standard CS67-38, 'Marking Articles made of Karat Gold';

"2. Commercial Standard CS47-34, 'Marking of Gold Filled and Rolled Gold Plate Articles Other Than Watch Cases'.

"In addition to these references, there is in existence a National Stamping Law of 1907, which draws up some extremely general and not too pertinent rules on the marking of karat-gold items, but which does give the force of law to the karat-gold standard.

"CS67-38, 'Marking Articles Made of Karat Gold', states in short the general rules for marking these items, the meaning of the karat mark, and the tolerance—which is ½ of 1 karat for nonsoldered items and 1 karat for soldered items. The standard provides for a 10-karat minimum fineness of any American article. Exemptions specified for the jewelry trade and not to be considered in any assay include springs, posts and separable backs of lapel buttons, posts and nuts for attaching interchangeable ornaments, and wire pegs or rivets used for applying mountings and other ornaments, which mountings or ornaments shall be of the quality marked. There are additional exemptions spelled out for the optical trade.

"CS47-34, 'Marking of Gold Filled and Rolled Gold Plate Articles Other Than Watch Cases', sets up the weight ratio

and karat designation for mechanically plated merchandise and defines the terms 'Gold Filled' and 'Rolled Gold Plate'. In short, the first designation of a mechanically plated item, as far as quality marking is concerned, must be the fractional designation which indicates the weight ratio between the alloyed gold contained in the article and the base metal. The second indication is the karat of the alloyed gold. The final designation, 'Gold Filled' or 'Rolled Gold Plate', is a further indication of the quality. Exemptions include joints, catches, screws, pin stems, pins of scarf pins, hat pins, etc., posts and separable backs of lapel buttons, springs, and metallic parts completely and permanently encased in a nonmetallic covering. A tolerance of 10 per cent is designated. A supplement to this standard, effective February 25, 1939, exempts field pieces and bezels for lockets from assay. This standard, as well as the karat-gold standard, indicates that if an item is to be quality marked it must be quality marked in this manner and this manner only.

Electroplated Jewelry Items

"While no official commercial standard or law exists covering the marking of electroplated jewelry items, the Federal Trade Commission has handed down a set of stipulations that may set precedent. Several principles have been established:

"1. The use of any karat mark in reference to electroplated goods is prohibited.

"2. The use of designations or wordage commonly applied and permitted for use on mechanically plated items is not necessarily prohibited in the marking of electroplated items but is frowned upon. For instance, instead of 'Gold Plate' or 'Gold Plated', the items 'Gold Electroplate' or 'Gold Electroplated' are preferred.

"Now under consideration is a proposed law which would set up certain standards for the marking of electroplated merchandise. Among other things this law sets up two qualities of electroplated merchandise:

"1. The quality with a thickness greater than 0.00001 inch.

"2. The quality with a thickness less than 0.00001 inch.

"At the present time the nomenclature used to describe these qualities is under discussion. There is no plan to present this proposed law to Congress in the immediate future.

Trade Practice Rules for the Fountain Pen and Mechanical Pencil Industry

"In addition to the above marking regulations for the jewelry industry, there was promulgated October 11, 1949 certain rules for the fountain-pen and mechanical-pencil industry which do not entirely agree with previous standards and which in some cases may set precedents. (These rules have already been quoted.)

Excise Tax Regulations That Affect the Jewelry Industry

"The Revenue Act of 1941, Section 2400, imposes a retailers' excise tax on jewelry at the rate of 10 per cent of the price at which the jewelry is sold. The effective date of this tax was October 1, 1941. Since then an additional 10 per cent has been added, making the excise tax 20 per cent at retail.

"An excellent reference to the use of this tax is 'Jewelry Tax Primer of the Retailers' Excise Tax on Jewelry, etc., imposed by the Revenue Act of 1941', prepared by the American National Retail Jewelers Association's Tax Committee in November, 1941.

"There are two types of taxable articles:

"1. Jewelry of all types, such as rings, chains, brooches, bracelets, cuff buttons, necklaces, etc., but not including articles carried about the person, such as canes, bags, purses, vanity cases, mesh bags, pencils, etc., unless they are ornamented, mounted or fitted with precious metals or imitations thereof. All jewelry is taxable, regardless of whether it is made of precious metals, base metals, plastics, wood, etc.

"2. Any item containing a precious metal or imitation thereof. These include gold, gold plated, silver, silver plated, or sterling flatware or hollowware.

"Fountain pens are specifically exempted from the tax if the only parts of the pen which consist of precious metal are essential parts not used for ornamental purposes. The Bureau has held that the only parts of a fountain pen which are classified as essential parts are the pen point, the filling clip, the clip for attaching to clothing, and the narrow bands placed on the cap for the express purpose of preventing slitting and expansion of the cap.

"There is no specific exemption for pen points, as is the case with fountain pens. Therefore, if made of precious metals or imitations thereof, they are taxable.

"The Bureau will hold that platings, in order to be considered imitations of precious metal and therefore taxable, must consist of a *plated* deposit of precious metal on the articles, as distinguished from light gilding, flashing, washing, dipping, or coloring. The Bureau has held that if an item contains a thickness of alloyed gold in excess of 0.00001 inch of better than 10-karat fineness, it is a taxable item. If the item is not normally taxed and contains an electrodeposit less than 0.00001 inch, it will not be taxed.

"The ruling that sets up this 0.00001 inch limit, signed by D. S. Bliss, Deputy Commissioner, reads as follows: 'It is held, however, that articles which are merely washed, dipped, flashed, or decorated by similar processes with precious metals, are not considered made of or ornamented with imitations of precious metals if the thickness of the platings resulting from the washing, dipping, flashing, etc., is less than one one-hundred thousandths of an inch' ".

Comments by E. A. Parker

Dr. Parker in his report makes the following comments and observations:

"The October 11, 1949 rule, whereby the word 'Gold Plate' was taken over by the mechanical platers, has set precedent for further action in related fields. As proof of this, the *Jewelers' Outlook* has reported, in December, 1949, that 'George Dumas, trading as Sterling Jewelers, has signed a Federal Trade Commission stipulation agreeing to stop representing as 'gold plated' certain watch bracelets which are merely flashed, washed, or colored with gold'.

"The expression 'a minimum thickness throughout equivalent to seven millionths (0.000007) of an inch thickness of pure gold' in the Federal Trade Commission Rules is vague in that it does not state specifically if average or minimum thickness is intended. Some believe that average thickness is inferred. However, in the Condensed Record of Meeting of Technical Committee for Proposed Commercial Standard for Marking of Gold Electroplated Articles TS–4187 on November 22, 1946 in Providence, R. I., statements appear which point to a minimum-thickness concept. Dr. Edward Wichers of the National Bureau of Standards, in explaining the background of a proposed analytical method, is reported to have stated that 'prior to its development, no convenient means was available for determining the *local* thickness of gold deposits of a few millions of an inch. The *average* thickness could be determined by assay, but since the serviceability of a plated article depends in large measure upon the *minimum*, rather than the *average*, thickness and since the thicknesses under consideration are at about the limit of resolving power of optical microscopes, a colorimetric chemical method was investigated' (*italics* ours). He then proceeded to describe the method (W. S. Clabaugh, J. Research Nat. Bur. Stds. **36**, 119 (1946)(RP1694) in which 1-mm² (0.00155 sq.in) is cut out of the part by means of a punch.

"In the discussion that followed, Dr. K. Schumpelt of Baker & Company, Inc., 'questioned the feasibility of plating to specified *minimum* thicknesses in view of the wide variations in plating thickness ordinarily obtained when using current shop methods . . . of the order of several hundred per cent', but Dr. C. B. F. Young, representing Swank, Inc., 'pointed out that a number of samples would probably be required to locate the area with the *thinnest* deposit' and Dr. Louis Weisberg, Consultant, 'concurred in this thought' (*italics* ours). Later a number of speakers expressed the belief that 0.000004 inch would be a more practicable limit than the 0.000007 inch minimum.

"Assuming that minimum thickness is meant, complicated parts would be permitted only 30 per cent overage without making them taxable under the Excise Tax Regulations which are construed to refer to average thickness. This is clearly an impossible situation.

"In the History of the Project summarized in Commercial Standard CS47–34, 'Marking of Gold Filled and Rolled Gold Plate Articles Other than Watchcases' it is stated, 'It was first proposed that the quality marks be on the basis of thickness of the gold coating, but this was found to be quite impracticable owing to the intricate shapes of many gold-covered articles and the fact that thickness would normally be computed from an overall assay of the gold content and the total area. Therefore, it was the concensus that the ratio of weight of the gold-alloy coating to the entire weight of the article should be the basis for the quality mark'.

"The consumer has little knowledge of just what an electroplated gold coating is or should be, and he certainly would not know the meaning of any marking in which the word electroplated were abbreviated, e.g., 'Gold E. P.' "

Dr. Karl Schumpelt of Baker & Company, Newark, N. J., and Dr. Louis Weisberg, Consultant, New York City, when asked to give their opinions about the present situation, made the following pertinent comments.

COMMENTS BY KARL SCHUMPELT

"Whenever standards are set up in any industry, the idea is to guarantee to the buyer a definite quality, or value, and to protect, in some degree, the manufacturer against price cutting under misleading labels. Therefore, standards are desirable, in principle, from the standpoint of both the manufacturer and the consumer.

"In the gold-jewelry industry, the Federal stamping laws and trade standards give the buyer the assurance that he receives a certain amount of precious metal in the article he buys. In the case of articles made of gold-filled or rolled-gold stock, both the gold content and the weight ratio of the gold layer to the base metal must be stated, the latter giving an indication of the wearing qualities to be expected. Thus, a marking of 1/10 12 karat indicates that an article is made of a composite material, the outside layer of which consists of 12 karat gold, this gold layer constituting one-tenth of the weight of the article. The Commercial Standard CS 47–34 also states clearly that the gold layer must be applied by mechanical means and must be of the specified karat *throughout*.

"In order to clear up a misunderstanding which some manufacturers seem to have, we point out that this standard prohibits the use of the above or similar markings showing a karat or a fractional designation or both for articles which are electroplated with an amount of gold equivalent to that of a rolled gold plate. Even a subsequent heat treatment, such as by the Beck process, could not produce a gold layer which is of a definite karat *throughout* as the standard requires.

"In the field of electroplated jewelry, the gold plating is done mainly for reasons of sales and eye appeal with a deposit of 0.00001 inch or less in thickness, mostly much less. For such deposits, no reasonable claims for wearing quality or protection can be made unless they are further protected by a good, hard lacquer. The intrinsic value of precious metal in electroplated articles of this kind is infinitesimal. Yet, in no other field is the unfamiliarity of the public with the terms and processes involved so ruthlessly exploited by misleading and often fraudulent markings on cards and tags attached to the articles. To guard the trade against such misleading markings, the reputable manufacturers in this highly competitive industry are endeavoring to set up fair trade standards.

"In several meetings which have been held to discuss this matter, the consensus of opinion seems to be that a minimum thickness of deposit should be established below which the word "gold" should not appear at all in any markings or descriptions. This limit is now tentatively set at 0.000004 inch; it is arbitrary and does not imply that articles with more than 0.000004 inch represent any value to speak of, either intrinsic or protective.

"Once this limit is written into a Commercial Standard, the difficulties of living up to it will become apparent. Anybody who is at all familiar with the plating methods presently used in this industry must realize that it will be very difficult, if not impossible, for the plater or "colorer" to turn out work which will unfailingly meet the specifications. Following are some reasons:

1. Constantly changing design and shape of the merchandise
2. Variety of plating solutions used to produce certain colors
3. Methods and 'tricks of the trade' to obtain certain effects, for instance 'tapping"
4. Methods of wiring or racking governed by nature of the articles or by reasons of expediency
5. The nonuniform distribution of the deposit
6. The desirability of getting the required thickness of deposit without the necessity for subsequent polishing or burnishing

"Reasons 5 and 6 will pose the most serious problems.

"The National Bureau of Standards reports in Research Paper RP1694 that the thickness of a gold deposit on a rectangular boxed surface may vary as much as 100 per cent. Tests conducted in the laboratory of Baker & Company, Inc., show differences as high as 300 per cent on rectangular surfaces which were not boxed. What will happen when articles are wired and plated in a cluster is anybody's guess.

"Making allowance for this nonuniformity by overplating so that the least favored part may receive sufficient deposit will lead into another snag: as things stand today, a deposit of 0.00001 inch will subject the article to a Federal Excise Tax.

"To understand fully point 6, the following experiment was made. A gold plating solution was made according to a formula which may be found in a shop:

3.5–4 dwt metallic gold as potassium gold cyanide
1–1.5 oz avoir free cyanide
2.5 oz avoir disodium phosphate

"A brass strip 3½ x 1 inches was plated between 2 anodes of equal size at a distance of 2 inches. The temperature of the bath was 150° F and the current density was 20 asf. It required a plating time of 40 seconds to obtain an "average" thickness of 0.000004 inch, as computed from the weight of the deposit and the surface area. The edges of the strip, receiving more deposit than the center, became dull and would have required polishing. Similar conditions, in exaggerated form, will prevail if a number of articles are wired and plated in a bundle or cluster.

"From the above, it is evident that the plater will have considerable difficulty in turning out production to meet the sespecifications, particularly when the plating time is measured only in seconds. It would be necesary to make frequent checks, and a test method should be available which would give quick and fairly accurate results.

"The National Bureau of Standards in Research Paper RP 1694 has developed and described a fairly accurate method of determining very small amounts of gold on a given measured area. In this way, the thickness of the gold deposit can be calculated with sufficient accuracy to be acceptable to the court in prosecution of violators. The execution of this test, however, is delicate and requires great care and some skill which may not be available in a plating shop. The man in the shop who would be held responsible for turning out work to specification needs a quicker and simpler method for making frequent checks. The time-honored nitric acid test, while giving some indication of the quality of the plate, is not accurate enough and is not accepted by the court.

"Another drop test was suggested by the writer in a meeting held on November 22, 1946 at the Providence Biltmore (Condensed Record XI-2/spc. TS-4291). Like the nitric acid test, it also gives an indication of the relative thickness of the deposit on the assumption that porosity will decrease with increasing thickness; it has the advantage of giving a sharp end point. It is felt that this test could be developed and correlated to the Bureau

of Standards colorimetric test, which would serve as an umpire test.

"Judging by the gold plating and coloring methods presently used, the writer believes that the vast majority of manufacturers of low-priced jewelry and novelties would not meet the 0.000004-inch limit.

"Since the Federal tax limit for deposits of 0.00001 inch or more is still in force, it may be more practical to abandon the idea of setting another thickness limit of 0.000004 inch. The old nitric acid test (or this writer's drop test mentioned above) could still be employed to weed out merchandise which had received an entirely insufficient gold flash to warrant the designation of "gold electroplate" or similar markings. Articles which do not stand up under the nitric acid test (or drop test) for a certain specified time, say one minute or two minutes, do not deserve to be designated as "gold" electroplated.

"This opinion is given only with the idea of emphasizing the practical difficulties which the manufacturers will encounter once a limit of 0.000004 inch has been established."

Comments by Louis Weisberg

"I have been following the controversy about the marking of gold-covered articles since 1932. I attended most of the trade conferences at which the commercial standards mentioned were adopted and have also been present at some of the Federal Trade Commission hearings where these matters were under discussion.

"Precedents have been set and rules established which put serious difficulties in the way of properly marking articles electroplated with gold or gold alloys. These rules and precedents have restricted the use of gold electroplating to the detriment of the public, the jewelry and related industries, electroplaters—in fact, everyone except the small group of rolled gold plate manufacturers for whose special benefit these rules were devised.

"My first interest in this matter was aroused in 1932 when the New England Manufacturing Jewelers' and Silversmiths' Association was attempting to have the National Stamping Act amended. This Act mentions the terms 'gold filled', 'rolled gold plate', 'gold plate', and 'gold electroplate' without defining them and is couched in such general language that there has been considerable difference of opinion as to just what its provisions mean. The amendments proposed by the Association would have defined these terms and the conditions under which they might be used. The effort to get action by Congress failed. Thereupon the Association turned to the trade-conference method with a view to setting up commercial standards that would accomplish substantially the same objectives.

"A number of such conferences were held, beginning in 1933. Comparatively few of the many jewelry-manufacturing firms invited showed up. The Jewelers' Vigilance Committee was represented. The strongest and most active group that took part was the delegation from the Rolled Gold Platers' Association.

"I was present as a representative of E. G. Bek Company, Inc., which controlled a patented process for making gold-covered articles by electroplating with gold or a gold alloy and then heat treating. I think it is correct to say that this process, which was quite new at the time, is what started the whole controversy. It was the first real threat to the general practice of making medium price jewelry from rolled gold plate—and the manufacturers of rolled gold plate lost little time going into action.

"Their first objective was to define the terms 'gold filled' and 'rolled gold plate' so as to reserve them for articles made from rolled gold plate. That corresponded to general usage and so, in my opinion, no exception could be taken to it. The next objective was to limit the use of the word 'gold' by providing that the quality mark should be expressed only in terms of the karat and fractional weight of the gold covering. This discriminated against the Bek process because the heat treatment brings about a change in the karat of the original electrodeposit due to diffusion between the underlying base metal and the deposit in such a way that one cannot speak of a uniform composition of the coating but only an *average*. The obvious alternative of marking the fineness or percentage composition was ruled out. No quality standard was set up for 'gold plate' or 'gold electroplate', and hence these terms were likely to become a dumping ground for goods of inferior quality and debased in the public mind.

"When it was suggested that a quality standard should be set up for articles made by the Bek process, the rolled-gold-plate people raised the legal point that it would be improper to set up a commercial standard for a patented process. This view was upheld by the Division of Trade Standards, even though it was admitted that there is no legal bar to such a standard.

"The use of gold or gold-alloy plating for applying substantial amounts of gold seems to require subsequent heat treatment to overcome the brittleness of most thick alloy deposits and to harden the gold coating by diffusion. The Bek patent has expired, and the process is now open for use without payment of royalty; but unquestionably its use has been held back by the restrictions on marking, in spite of its other advantages.

"The commercial standards have been extended by trade-practice rules and rulings of the Federal Trade Commission so that manufacturers of jewelry, eye-glass frames, watch cases, and gold-covered articles of almost any kind are handicapped in the truthful marking of their products, particularly with respect to the use of the word 'gold'. It is now proposed to extend them to fountain-pen parts.

"That these restrictions have held back technological improvements involving the use of gold electroplating cannot be doubted by anyone familiar with the situation. And, of course, to the same extent it has limited the field for employment of electroplaters in a field calling for technical skill and experience. Even if it is assumed that these rules have accomplished all that might be hoped for in checking fraud and deception, it is arguable, I think, that the public and the industry have lost more than they have gained through the stifling of technological advances and the setting up of a monopoly by the manufacturers of rolled gold plate.

"It is a curious fact, moreover, that with all this interest in protecting the buyer against misrepresentation or chiseling, not a thing has been done to compel the manufacturers of rolled gold plate to mark their product to show truthfully what it contains, to set tolerances for the gold content, or to compel them to live up to the same standards they want others to follow.

"The gold content of an article retailing for ten dollars is very seldom over a dollar and is usually more likely to be not over half a dollar. Much more important than the intrinsic value of the gold is whether or not it is so applied as to give maximum resistance to wear and corrosion. Articles made of rolled gold plate have raw edges of base metal. These are usually covered only by a flash plate of gold a few millionths of an inch in thickness, sometimes supplemented by a lacquer coating. There are obvious advantages to making an article out of base metal and then covering all surfaces by electroplating with a gold deposit of sufficient thickness to insure ample protection against wear and corrosion. That this is an entirely practical procedure has been demonstrated on many, many thousands of bracelets, watch bands, watch cases, and other items. Yet any manufacturer who uses a process of this kind cannot mark the gold content in a perfectly truthful manner without getting himself involved in long-drawn-out and expensive proceedings before the Federal Trade Commission and perhaps in the courts.

"The Executive Board of the American Electroplaters' Society might well consider whether or not it would be advisable for the Society to be represented when questions like this come up before the Federal Trade Commission."

Others are invited to contribute to this discussion.

Why Pay For Porosity Research?*

W. A. WESLEY

Assistant Director, Research Laboratory
The International Nickel Company, Inc., Bayonne, N. J.

In preparing this talk I did a little research of my own: I attempted to determine how many organizations in the United States conduct research on electroplating as a significant part of their activities. I went through the publications of the American Electroplaters' Society and the Electrochemical Society for the last four years and made a count of all companies and institutions which had published a paper or were granted a patent indicating that some pure or applied research in this field had taken place. The answer was 86 and included university laboratories and research institutes. As a check on this figure I counted the number of research laboratories listed in the 1940 Bulletin No. 104 of the National Research Council as conducting research in electrodeposition, plus some names I knew which were omitted, and I came up with the figure 63. If one adds to the original 86 those in the second group of 63 and eliminates duplication, the final result is 123 different laboratories which are active or have been active within the last few years in experimental or development work in the field of electrodeposition.

With so many institutions engaged in improving the art of electroplating, what need exists for an A. E. S. sponsored research program? Why expend so much effort as is done by your Research Committee year after year with a net effect of increasing the number of laboratories working on plating by a mere ten per cent? The answer is, of course, that nearly all the 123 laboratories are performing a different kind of research from what we want. In the plating industry we are faced with certain problems these laboratories have never solved and are not apt to solve, problems which require a different approach from those they are prepared or permitted to use.

Research can be divided into categories determined by the frame of mind or the spirit in which the work is done. If the search is for facts about the properties and behavior of matter to increase knowledge of nature's laws without regard to the creation of wealth we call this fundamental, or basic, research. I prefer to call it "scientific research". If the work is limited to a search for facts and principles related to a specific application it may be called applied or industrial research, but I prefer the term "technical research". Still another type of work was defined recently by C. M. Parker of the American Iron and Steel Institute as follows: "There is a common belief that whatever goes on in a conventional laboratory is research . . . Much control, development, and testing work is done in laboratories and while a great deal of it is technical work of a high order of excellence it is not research because it is not seeking new knowledge. Rather, the work is an application of technology to improvement, testing, and evaluation of a process, material, or device resulting from research".

Plating Research

To get back to the plating industry; I will hazard the opinion that not more than ten of the 123 laboratories perform much scientific research in the field of electrodeposition. The rest do technical research as I have defined it or are simply more or less high grade testing or development laboratories. They study to improve the quality of products, to develop *new* processes or products, to develop new *uses* for existing processes or products, to reduce costs, and to cure troubles of production or use. Obviously, it would be short-sighted of the A. E. S. to spend the bulk of its research funds in competition with more than a hundred laboratories now busy exploring all promising avenues to profitable developments and on the alert for good leads.

It is true that there are some problems of our industry which are amenable to technical research yet require cooperative action or agreement, hence have not been settled by one laboratory acting alone. The setting up of standards and standard tests is one example. Other problems may not be important enough to any one company to justify shouldering the entire expense necessary to solve them but do justify generous contributions to a cooperative effort. The disposal of plant wastes is an example of this type. But by and large the A. E. S. cannot be content to allow the hope of a healthy future for the plating industry to rest upon technical research. As any field is more extensively explored it becomes more and more difficult to make improvements in it. The technical researchers and inventors use up all the clues and leads available in the fundamental knowledge in that field, knowledge which had originally been provided by scientific research. They begin to need more such leads in order to go on.

Porosity Research

To bring this point home I have a good example from the plating industry itself. Can you think of any topic which has

*Presented at the Research Session of the Boston Convention, American Electroplaters' Society, June 15, 1950.

been the subject of more experimental work than has porosity of electrodeposits? The salt spray test alone (which we *think* we use to measure porosity) has been the subject of a hundred publications and a million words. The first plating assignment I was given by my company more than twenty years ago was to determine the cause of porosity of nickel deposits. After a serious study of the phenomena I reported as follows: "It was attempted to eliminate porosity from nickel deposits by altering the conditions of deposition or the nature of the cathode surface in such manner as to minimize each of the suggested causes of that defect. These attempts failed and the principal cause of porosity still remains unknown". The good deposits one mil (25 μ) thick I made then showed 1 to 50 pores per sq.dm. in the ferricyanide test popular at that time, the same as good deposits do now. It is true that we have learned to increase protective value by increasing thickness, and that was a mighty important thing to learn, especially for the Nickel Company.

When your Research Committee was reorganized in 1944 a scientific research to determine the nature and effects of porosity was immediately placed high in the list of projects to be started. It seemed obvious that progress in improving the protective value of electrodeposits would remain at a halt until some fundamental knowledge of the nature of porosity and the structure of deposits was accumulated. We did not want a technical research—there had been plenty of that by many laboratories and for decades. We wanted work from a scientific and fresh viewpoint.

Project No. 6 was established at a university renowned for its originality and success in scientific research, Princeton University. It was set up under the supervision of Dean H. S. Taylor, himself noted for originality and success in fundamental research on reactions at metal surfaces. It was put under the immediate direction of Dr. N. Thon, who had performed brilliant and original research on the structure of electrodeposits in France before the war. We were aiming earnestly to get originality, a new kind of attack; and we *are* getting it now at Princeton. In addition to the six research papers which have already been published in the magazine PLATING by Thon and the A. E. S. Associates, Ling Yang and D. Kelemen, your Research Committee and the Project Directing Sub-Committee No. 6 have received three more which are going to amaze you and upset some of your longest-held beliefs*.

Let us review a few of the important things we know today about electrodeposits as a result of the Princeton work, things we did not know in 1946:

1. All thin electrodeposited foils of the metals tested, including those of iron, nickel, copper, and silver, are permeable to gases. This permeability differs from the old concept of porosity because it is measurable and reproducible and is independent of channels through the metal large enough to be detected under the microscope.

2. The permeability decreases rapidly with increase in thickness until most metal deposits of good quality and one mil thick are not porous enough to show any permeability at all by the Princeton high-vacuum test procedure.

3. Confirming a fundamental difference in structure from that of electrolytic foils, wrought metal foils do not show this gas permeability.

4. When metal foils one mil thick (including wrought metal foils) are exposed in corrosive surroundings they become measurably permeable to gases before there are visible evidences of corrosion. The common porosity tests such as the ferroxyl and hot water tests are corrosive to nickel foils and increase their permeability.

5. When nickel foils deposited under different conditions are exposed to corrosion in laboratory tests they show about the same losses in weight but differ widely in time to perforation. Failure is not due to general corrosion but to localized penetration in depth. A significant point is that whereas the loss in weight does not correlate with resistance to perforation, the change in permeability does. It is hoped that permeability changes will also prove to correlate with protective value in the atmosphere.

6. The amount of hydrogen occluded in a nickel deposit decreases with increasing thickness of the layer. This has been shown definitely at Princeton and the data may be very important in regard to the theory of the causes of stress in electrodeposits. You will recall that unit stress in nickel deposits decreases with increase in thickness.

7. Definite evidence has been obtained that sound nickel deposits 0.4 mil (10 μ) thick, which are measurably permeable to gases, nevertheless are not detectably pervious to liquids. They continue to protect the steel in laboratory corrosion tests until corrosion of the nickel layer has progressed to the point of opening visible pores to the base. These nickel deposits obviously had no gross pores in them to start with and in this sense it can be said that it is easy to prepare small specimens of electrodeposits free from porosity since this is done daily at Princeton.

IDEAS FOR FURTHER WORK

Now what about clues and ideas for further technical research that one can find in the scientific work at Princeton? Don't forget that many of our hundred technical research laboratories are ready to evaluate the commercial possibilities of these ideas at no cost to the A. E. S.! Here are a few out of the scores of them that can be found in the Princeton reports:

1. Copper from a cyanide bath is more permeable to gases than copper deposited from the acid-sulfate electrolyte.

2. Nickel and iron deposited from pure sulfate baths are more permeable and corrodible than deposits from chloride baths.

3. Some organic addition agents increase the permeability and corrodibility of nickel deposits.

4. The permeability of thin nickel, iron, and silver deposits, say 0.2 mil thick or less, is markedly influenced by the surface condition of the base, a buffed surface being worse than an etched or electropolished one. This effect is paralleled by corrodibility of nickel deposits, so that it may be significant in plating thin coatings on articles for indoor use. The differences in permeability tend to disappear as thickness of the deposit is increased.

5. In an accelerated acid-fume corrosion test nickel layers were more protective to steel when plated over an undercoat of electrolytic iron. The Princeton theory is that the iron layer makes the steel surface more uniform, leading to a less permeable nickel deposit.

6. In the Princeton atmosphere the permeability of nickel deposited under three different sets of plating conditions increased with weathering at rates correlating with the initial permeabilities of thin layers of the same types of nickel. If this sort of correlation is born out in other atmospheres, a new technique useful in developing plating processes will be available.

7. Annealing a nickel foil at 750° F reduces both its permeability and corrodibility.

8. The application of a chromium deposit 80 millionths inch (2μ) thick markedly decreased the corrodibility of nickel coatings on steel and tended to make the various types of nickel deposits behave more nearly alike.

NEW POROSITY RESEARCH PROJECT

Some of the above clues are considered so important by the members of the Research Committee that it has been decided to start a new project with the objective of learning whether any correlation can be established among the permeabilities of various electrodeposits,

(*Continued on page 953*)

*Published in the June and July issues of PLATING.—EDITOR.

Pollution Abatement in the Ohio River Valley

The Ohio River Valley Water Sanitation Commission held a meeting with a group of electroplaters from that region on June 20, 1950, in order to explore mutual problems and to establish a liaison group for future work on stream pollution abatement. At the request of A. E. S. President Neill, I attended this conference as a Society representative.

This Commission is an interstate agency, authorized by the federal government, and composed of three members from each of the signatory states and three from the federal agencies concerned. The states at present represented are Illinois, Indiana, Kentucky, New York, Ohio, Pennsylvania, Virginia, and West Virginia (the present status of West Virginia is in doubt, due to legislative difficulties). Probably within the near future, the states of Alabama, Georgia, North Carolina, and Tennessee will also come into the Commission. This interstate group is pledged to abate pollution of the Ohio River and all of its tributary streams, and each of the states has agreed to cooperate in this abatement program.

Previous to the meeting of June 20, the Commission had held similar conferences with representatives of other industries, including the distillers, the iron and steel producers, and the chemical brine industries. The electroplaters have not been selected for any unusual attention, but since they comprise one of the major sources of pollution, they are being asked to cooperate with the Commission.

The Commission was represented at this conference by Joseph L. Quinn, Jr., Chairman; Henry Ward, incoming Chairman; and several other Commissioners from most of the states involved and from the federal government; also Edward J. Cleary, Executive Director and Chief Engineer; Kenneth S. Watson, Assistant Director; and John E. Kinney, Sanitary Engineer. Among the manufacturers represented by one or more men each were: American Radiator & Standard Sanitary Corporation, Electric Auto-Lite Company, General Motors Corporation, Hamilton Manufacturing Company, Houdaille-Hershey Corporation, National Cash Register Company, Noblitt-Sparks Industries, Inc., Standard Steel Spring Company, and Westinghouse Electric Corporation. The A. E. S. was represented by W. B. Knight (Research Chairman of the Detroit Branch) and myself (technical adviser to the Waste Disposal Project Committee), and incidentally by most of the companies listed above, who are Sustaining Members.

Mr. Quinn and Mr. Cleary, aided by the other Commissioners, pointed out the reasons for this conference and what the Commission expected from it. From the electroplaters' point of view, we should be interested in pollution abatement as it will lead to improved quality of water supplies, better relations with the public (our customers, our employees, and ourselves), and improved interindustry relationships. The Commission's plans involve three fairly obvious steps: (1) plant surveys to determine the type and quality of the wastes, and possible improvements in processing to reduce or eliminate wastes, (2) research on treatment methods, such as is now being conducted by the A. E. S. Research Project 10, and (3) translation of the research findings into practice in individual plants. Some of the technical staff of the Commission have had experience with plating wastes, and their cooperation is assured; however, it is up to the platers to take the initiative in this research and in pollution abatement.

Several of the plating industry representatives described the work on waste disposal at their plants, and I had an opportunity to outline the research program of the A. E. S. and to discuss the progress being made in Project 10. This included showing copies of the two Research Reports so far published and a manuscript copy of the paper on analytical methods for cyanides, as well as a description of the present work on cyanide treatment.

The principal outcome of this meeting was the formation of a committee from industry to work with the Commission on matters relating to stream pollution. This is to be known as the Metal Finishing Industry Action Committee of the Ohio River Valley Water Sanitation Commission. Walter L. Pinner (Director of Research, Houdaille-Hershey Corporation, Detroit; Member, A. E. S. Research Committee) was elected Chairman of this Committee, and Mr. Kinney was approved as the Commission delegate to the Committee. The Commission will write the major plating concerns in the area, asking that the management of each plant designate an official representative to the Committee; further action was not taken at the meeting of June 20th because the men present were not sure of their official status.

The objectives of this Committee were stated as: (1) the assembling of available information on waste practice among the member companies, (2) the pointing out of missing information and suggesting means by which it may be obtained, and (3) the recommending of limits of tolerance for pollutants in plant effluents, based on practical treatment procedures. Much of this work falls among the goals of A. E. S. Research Project 10. However, it is feared that more rapid progress will be needed, and it is believed that the Project should be expanded both in the quantity of research being done and in liaison work with the industries, the regulatory agencies, and other related research projects currently active.

This conference served the valuable purpose of acquainting both parties (platers and regulatory agencies) with the problems of the other. There was full agreement that pollution abatement will go forward, and that industry must recognize this fact and plan accordingly. The larger plants have cooperated in this way for some time, but missionary and educational work is needed among the smaller platers, and further coordination is desirable among all platers.

C. FRED GURNHAM,
Tufts College, Medford, Mass.

The Metal Finishing Action Committee of the Ohio River Valley Water Sanitation Commission later met in Cincinnati, on July 26.

"The war emergency", said Walter L. Pinner, Manager of Research, Houdaille-Hershey Corporation, Detroit, and Chairman of the Committee, "has accented the efforts of this Committee and the Commission in promoting control of industrial waste. A manual of plant practice is being developed for electroplating establishments with a view toward curtailment of wastes that may cause pollution of streams. It will also point to salvage of metals and solutions now being wasted that are likely to be in short supply because of the war".

In Mr. Pinner's opinion better "housekeeping" methods, which will be outlined in the manual, will reduce discharges from some plants by as much as 50 per cent. This alone will represent an important contribution to stream clean-up efforts.

In addition to the preparation of the manual, the metal-finishing group appointed subcommittees to

(1) evaluate present waste treatment methods—Chairman, Hubert S. Kline, Industrial Hygiene Engineer, General Motors Corporation, Dayton, Ohio

(2) outline ways of conducting plant waste surveys—Chairman, William H. Toller, Jr., Chemical Engineer, Houdaille-Hershey Corporation, Huntington, W. Va.

(3) study toxicity potentials of various wastes—Chairman, R. G. Collar, Director of Research, National Cash Register Company, Dayton, Ohio

(4) develop standard analytical procedures—Chairman, William J. Neill, General Superintendent, Columbus Metal Products Company, Columbus, Ohio, President of the American Electroplaters' Society.

To insure close coordination with the industry group representing the steel industry, C. C. Cupps, Assistant Chief Engineer of Standard Steel Spring Company, Newton Falls, Ohio, was appointed liaison-contact member of the committee.

E. C. A. Arranges Visit by British Metal Finishers

A team of thirteen British metal finishers arrived in New York on August 18 to spend about five weeks visiting industrial concerns in the areas of Hartford, Conn., New York, Philadelphia, Youngstown, Cleveland, Chicago and Detroit.

The itinerary has been prepared by Mr. Julius Demeter, Project Manager, Technical Service Branch, Economic Cooperation Administration, 2 Park Avenue, New York City, in cooperation with Dr. A. Kenneth Graham, Executive Secretary, American Electroplaters' Society. Branch secretaries of the Society in these areas will be advised of the itinerary in the hope that the visitors may find it convenient to attend one or more Branch meetings.

The team wishes to study metal finishing in America and report on methods used which might be applied to the parallel British industry to increase its productivity and efficiency.

Metal finishing is defined for this purpose as all manufacturing processes directed to the embellishment or prolonged protection from corrosion of manufactured metal articles or both, together with a number of related processes which are either preparatory to the main process or conveniently operated by similar plants. Hot dipping, tinning, galvanizing, vitreous enameling, metal spraying when used as a final process, and other processes employing high temperatures are excluded from consideration by this metal-finishing group of specialists.

Increase of productivity and efficiency will no doubt be judged by the (a) increased output of a given labor force, (b) increased durability and effectiveness of a given finish, (c) reduction of overall costs of a finishing process to produce the required result, and (d) improved conditions of labor compared with previous methods.

The team desires to discuss costing and labor conditions, as well as purely technical matters. It wishes to see the following:

1. Ancillary processes, including descaling and pickling; metal polishing, smoothing, and burnishing; degreasing by vapor, emulsion, alkali, and others
2. Applications of paint and lacquer, including preparatory processes therefor: mechanization and application; methods (spray, dip, flow, roller, hot spray, and electrostatic); spray booths (down draft, water spray, etc.); bake ovens (batch, continuous and infra-red; specifications and tests
3. Electroplating: plating plants, automatic and semiautomatic, with improved accessories; new processes such as bright plating, "leveling", PR plating, etc.; plating on difficult metals, such as zinc base diecasting, aluminum alloys, and magnesium alloys; plating from fluoborate solution; cleaning, polishing, and buffing methods with special machines; electropolishing; specifications and tests
4. Electroplating for special purposes: electroforming as a production process; continuous electrodeposition of tin on sheet steel, including the use of high-frequency heating for flowing
5. Special finishes: impregnants for sealing heavy castings; finishing of diecastings; silicon heat resistants; one-coat hammered metal finishes; airdrying and baked finishes.
6. Chemical and electrolytic finishes: phosphate and oxide coating of metal; chromating and passivation of zinc and aluminum alloys; anodic oxidation and dyeing of aluminum; electrocoloring, etching
7. Influence of design on ease of finishing
8. Storage and paint-circulation mixing facilities
9. Plant layout
10. Safety precautions, health hazards
11. Training of labor
12. Employee relations, job structure, wage rates, collective bargaining agreements

Among the visitors are the following:

J. N. T. Adcock, I. C. I. (paint manufacturers), Team Leader

N. A. Tope, Montgomery Plating Company, Coventry, Deputy Leader

John Line, Lines Bros., Triang (toy works)

E. C. J. Marsh, Standard Telephones, Ltd. (telecommunications and radio)

Bernard Turner, Monochrome Ltd., Birmingham

M. F. E. Fry, Joseph Lucas, Birmingham (motor accessories)

L. C. J. Connell, General Electric, Wembley (electrical equipment)

N. R. Watts, Glasso Paints, Acton, London

G. H. Woodall, Messrs. Cannings, Birmingham (plating equipment manufacturers)

Dr. Campion, British Aluminum Company, Chalfont

R. H. Willetts, W. & T. Avery, Ltd., Birmingham

Victor Long, National Union, General & Municipal Workers

R. A. F. Hammond, Armament Research Establishment, Ministry of Supply, Secretary

The Anglo-American Council on Productivity was established in September, 1948 as a result of discussions between Sir Stafford Cripps and Mr. Paul Hoffman of the advantages to the British economy which could result from first-hand studies of the methods and techniques which have enabled U. S. industry to achieve its high rate of productivity. The Council is composed equally of management and labor leaders from the United States and Great Britain. Under the Council's auspices more than thirty productivity and specialist teams have studied in America during the past eighteen months.

Specialist teams such as the metal finishing team reach a cross-section of industry. Team members represent their industry as a whole. The particular firm from which a member is chosen continues to pay his salary during his absence from regular duties, the British government provides funds for expenses incurred through travel in England and the sea voyage, the Economic Cooperation Administration provides travel and subsistence while the team is in the United States.

The team's work is divided into three parts: a tour of their British industry, the study of the American counterpart industry, and implementation of their findings through publication of a report and meetings in order to disseminate the information they have obtained throughout the British industry. Team visits have resulted in a two-way flow of information; in many instances the teams have imparted information of value concerning British techniques and "know-how". Their reports have aroused considerable interest in both England and the United States. There is already much evidence that these team visits have produced results which have been a contributing factor in the improved condition of the British economy.

Diecastings

(*Continued from page 937*)

die merely to facilitate subsequent handling by gate-breakers and inspectors. However, quenching actually serves a more important function, which is to prevent or minimize warpage of large castings with unequal cross section. Quenching also causes castings to shrink to a greater extent upon aging, which is of little consequence except in applications requiring the utmost in dimensional accuracy and so should be avoided in these special cases.

3. *Spacer and Nozzle Temperature.* Many operators fail to realize the importance of spacer or nozzle temperature. Theoretically these parts need only be maintained hot enough to prevent the alloy from freezing in them in the interval between "shots". In many instances, excessive nozzle or spacer temperature is the direct cause of producing bad castings in a manner similar to that when the alloy in the melting pot and gooseneck is overheated. Also, indirectly, an excessive flame from a spacer or nozzle torch may locally overheat the cover half of the die causing heat pits on the casting in this area.

4. *Care of the Die.* Many diecasting-machine operators fail to realize that a die, designed to produce parts to tolerances of a few thousandths of an inch, is a piece of precision equipment that requires many weeks to build and that must be treated with care and given regular attention in order to keep it in proper operating condition.

To minimize the possibility of damaging any die and particularly a new one, an operator should carefully examine the die before making any castings to familiarize himself with its operation, core action, if any, ejection mechanism, water lines, etc.

Summary

The many factors influencing the production of sound diecastings with good surface finish have been discussed. It will be appreciated that many of these factors, although discussed individually, are related. Therefore, all must be controlled simultaneously within fairly narrow limits to keep rejects at a minimum.

It must also be realized that the operation of a diecasting machine is still more of an art than a science. Accordingly, an operator must use his personal skill and ingenuity in order to obtain the maximum number of good castings from a die during a given production run. This "personal touch" accounts for the fact that one operator can obtain more good castings from a particular die during a production run than another operator.

A good diecasting machine operator, then, is one who not only understands all of the factors influencing the production of good castings but also "senses" when it is necessary to correct conditions that cause defects before they occur.

Determination of Ammonia

(*Continued from page 944*)

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Porosity Research

(*Continued from page 950*)

their behaviors in accelerated corrosion tests, and their protective values in various atmospheres. This new Project 13 will be started soon at the National Bureau of Standards with Mr. Fielding Ogburn as Project Director. A subcommittee comprised of Dr. William Blum, Mr. A. Mendizza of the Bell Telephone Laboratories, and Mr. Clarence Sample of The International Nickel Company, Inc., will represent the Society in this work. The members of the new Subcommittee and those of Subcommittee 6 will hold frequent joint meetings to insure close collaboration of the Princeton and Washington projects and to avoid unnecessary duplication of effort.

Recapitulation

The idea that technical research and development are dependent upon a basis of scientific knowledge is not new. You have been reading about it in the daily newspapers ever since the middle of the war and you are paying every year millions of dollars for scientific research in the budgets of our defense departments. Experience has shown that a good technical research or development man does not make the best scientific researcher and vice versa. Industrial laboratories by their very nature cannot employ men who are extreme individualists, yet very often it is just such men who are able to provide the fresh point of view that opens up new fields for progress. Here is where research funds of the A. E. S. can be profitably spent, namely, to get some good scientific researchers interested in problems in the field of electrodeposition. We can then hope to be provided with fundamental information and an insight into the mechanism of plating which will stimulate inventions, developments, and improvements necessary for the progress of the plating industry.

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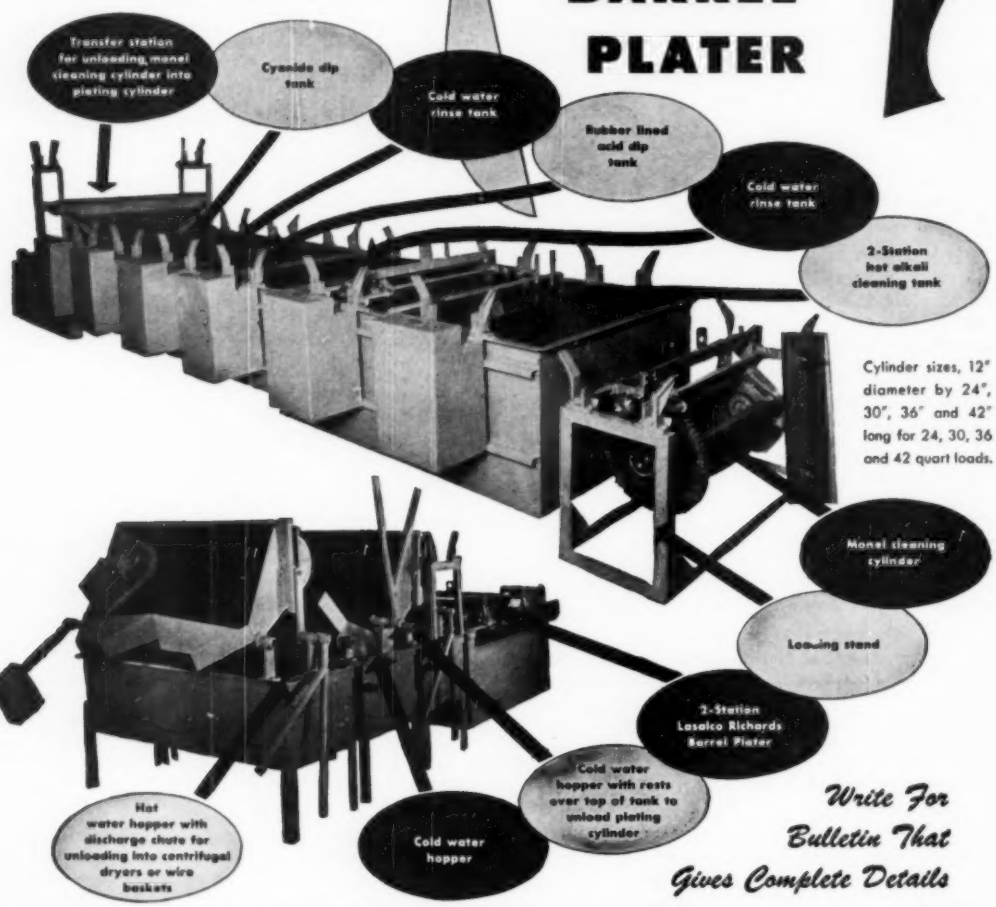
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readers' questions of general interest

Q. 94. We are interested in the retinning of 5-gallon milk cans. How does retinning of old, partly worn-off tin surfaces differ from tinning of fresh steel?

A. The procedure for retinning of old articles is essentially the same as for tinning of new work. It is not necessary to remove any of the old tin that may remain, because it will readily fuse with the new tin, thereby effecting a small saving of metal, as well as avoiding the time and labor required to dissolve the old coating.

The surface of the work must be thoroughly cleaned. Surface dirt can be removed in a hot alkaline cleaning bath, scale and rust by pickling in a 5–10 per cent solution of sulfuric or hydrochloric acid, hot or cold. Thorough rinsing in clean water should follow each of the above operations. The articles are then passed through a zinc chloride flux and while still wet with flux are introduced into the tin bath.

The tin bath, if used for food-handling equipment, should be pure Straits tin at 600° F. The surface of the bath should be covered with a blanket of molten zinc ammonium chloride through which the work is passed while being immersed. This blanket serves two important purposes: (1) it provides additional hot-fluxing action, and (2) it prevents excessive oxidation of the molten tin by insulating it from contact with the air.

After the article has remained in the bath long enough to have assumed the temperature of the molten tin, it may be withdrawn for inspection to see that it is completely coated and is again introduced into the tin. The flux blanket is then skimmed aside, so that the work may be removed through a clean metal surface. Depending on its size and shape, the work should be withdrawn so that significant surfaces leave the molten tin at right angles to the surface of the bath. Practice and experience will dictate the best method of withdrawing various types of work.

In the case of milk cans, the procedure is as described with some additions. The can is first disassembled by immersing it in the tin bath, which melts the solder, allowing the can to come apart. The separate parts are then examined, and where necessary they are restored to their original shape by removal of dents, straightening, etc., after which they are put through the retinning process as outlined in the foregoing. They are then reassembled by soldering, with the result that the can has not only been retinned but also rebuilt.

Some milk cans of recent manufacture are of welded construction and can be handled in one piece, which greatly simplifies the job.

Tinning of cast iron is fraught with many difficulties and should not be attempted without expert advice on the specific material to be handled.—FRED M. CARLSON.

Q. 95. What is the average thickness of tin on hot-dip tin plate? What are the specifications for thickness of tin on tin plate for different food stuffs?

A. Hot-dipped tin plate comes in two principal grades: 1.25 and 1.50 lb per base-box pot yield. Theoretical thickness per pound pot yield is 0.000060 inch. Electrolytic plate comes at present in four commercial grades: 0.25, 0.50, 0.75 and 1.00 lb per base box. Within five years it is probable that 80–85 per cent of all plate produced in the United States will be electrolytic.

I know of no specifications on tin thickness for food packs. There are, however, some accepted practices. At present, all red sour fruits are packed in cans of 1.50 hot-dip plate, lined with sanitary enamel and having a striped side seam; most citrus fruits and juices in cans of plain 1.25 hot-dip plate; most soups and sulfur-bearing foods, such as beans, peas, fish and meat products, in lined cans of 0.50 electrolytic plate; evaporated milk in either 0.75 electrolytic or 1.25 hot-dip plain cans. The 1.00 electrolytic plate is coming into experimental use as replacement for 1.25 hot-dip plate.—S. S. JOHNSTON.

Q. 96. I nickel and chromium plate holloware with 15 per cent antimony-lead spouts and handles and get satisfactory results on all parts except the plain handles and spouts with smooth surfaces. My cycle is (1) degrease, (2) immersion clean in mild cleaner, (3) rinse, (4) scratch brush, (5) reimmersion in the cleaner, (6) rinse, (7) fluoboric acid rinse, (8) rinse, (9) copper strike, (10) rinse, (11) sulfuric acid dip, (12) rinse, (13) bright-nickel plate, (14) rinse, (15) chromium plate. I check the adhesion of the plate to the base metal by immersion in hot water for twenty minutes. What is wrong with my cycle?

A. The following cycle has been used successfully for plating on buffed lead-antimony: (1) soak alkaline clean, (2) rinse, (3) anodic treatment in 10 per cent by volume fluoboric acid for 2–5 seconds at 6 volts, (4) rinse, (5) nickel plate.

We have been informed that best results are obtained with dull nickel, nickel containing organic brighteners sometimes giving difficulty when the deposits are subjected to a hot-water test.—C. STRUYK

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Book Review

DR. HAROLD J. READ
Associate Professor of Metallurgy, Pennsylvania State College

CHROME DUR published annually by the Centre d'Information du Chrome Dur, 209 Boulevard Saint-Germain, Paris 7°, France.

This annual publication contains many original papers and considerable review material of great interest in the field of hard chromium plating—a process which the French have developed to a marked extent. An attempt has been made below to indicate the contents (all in French) of two recent volumes. The modest number of pages in each issue is somewhat misleading as to the total amount of reading matter contained therein, for page size is large and type size small.

1948 Volume (86 pages, price 500 francs)

The first paper deals with the industrial applications of thick electrodeposits of nickel and chromium, but does not give techniques or methods of depositing the metals. Some interesting data on the change of hardness with temperature of nickel and chromium are shown graphically.

Probably the most provocative paper in this volume is one on the presence of microfissures in chromium deposits. Micrographic, X-ray, hardness, and fatigue data are used to develop a theory on the source of brittleness in electrolytic chromium, and it is shown that these fissures affect adversely the fatigue strength of a 13 per cent chromium steel on which chromium has been plated.

An article on the measurement of microhardness reviews the available methods and contains much valuable information on errors which can be caused by such factors as load, piece position, and the microgeometry of the workpiece surface. Graphs, tables, and photographs illustrate some of the pitfalls.

The production of porous chromium deposits on aluminum and its alloys is discussed in a paper by van der Horst, which also includes an examination of their nature. The specific application mentioned is for the plating of engine-cylinder walls, and an instrument for inspecting the interior surfaces of cylinders is described. Another paper on the same general subject by Patrie gives specific directions for the execution of the technique which he has worked out.

M. Morisset is the author of two articles, both of which are of a review nature. The first is concerned with industrial applications of hard chromium and describes in some detail a number of interesting developments. The second is a compilation from many sources of graphical information concerning the operation of chromium plating baths and the properties of the deposits obtained under a variety of conditions. This material is well organized and should prove useful.

There are a number of other articles and reports of discussions as well as a general bibliography of 146 entries covering the more important articles on chromium plating and allied matters over the period 1940 to 1948, with emphasis on the later years.

1949 Volume (72 pages, price 1000 francs)

The leading paper (by Jacquet and Weill) is a report of the application of electrolytic polishing and X-rays to the study of hard chromium. It is reported, among other things, that there are fewer fissures in chromium deposits on steel that has been electropolished than on steel that has been prepared mechanically. The heterogenieties of the steel appear to be the source of many of the fissures, and their effect in causing fissures is less when the steel is electropolished. A deposit with few fissures is said to be more corrosion protective and to influence less the fatigue properties of steel than the usual highly fissured deposits. The X-ray results showed that a greater degree of preferred orientation is found in the chromium deposits made on electropolished steel than in those applied to mechanically polished steel

The chromium plating of gauges is the subject of a short but interesting paper where the possible advantageous use of very thin coatings for the direct restoration of worn gauges is discussed.

The uses of electrodeposited chromium in the automobile industry is well reviewed in a paper which emphasizes the techniques employed in plating cylinder walls but covers also other applications for both thick and thin deposits, such as gauge and tool plating.

There are several applications in the textile industry where hard chromium can be employed to advantage, particularly in spinning machines. These are described in an article wherein not only present uses but possible future applications are discussed. The paper is limited to uses rather than to plating techniques.

A comparatively simple thickness gauge applicable to chromium deposits on steel is described in a short paper. The instrument depends on the measurement of variations in reluctance with variations in the thickness of the chromium. It is claimed that the apparatus is sufficiently accurate for practical control work.

Another paper on practical applications of hard chromium plating is concerned with the evolution of the process in France. The history, importance, and industrial applications are discussed and illustrated.

Several other articles, most of them quite short, are to be found in the volume, and at the end, M. Morrisset has provided a review article based upon 27 publications from countries other than France which have appeared recently on the subject of hard chromium plating and related subjects.

It is difficult for a reviewer reading a language not his own to evaluate minor errors of typography, etc., but it is hoped that they are not as extensive in these volumes as would be indicated by the several errors which were noted in short English passages. Those who use the bibliographies will want to be on the look-out for references where the author's first name is given in full and his surname appears as an initial, e. g., Professor Swann is cited as Sherlock S.

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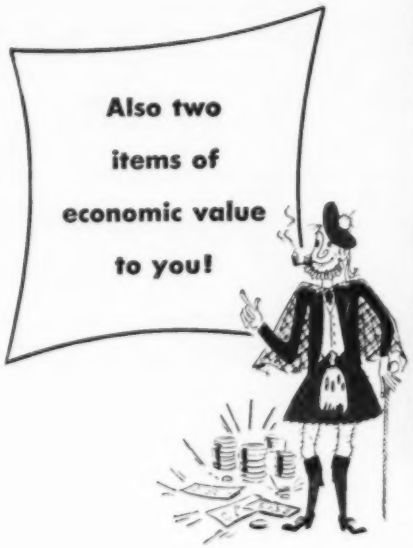

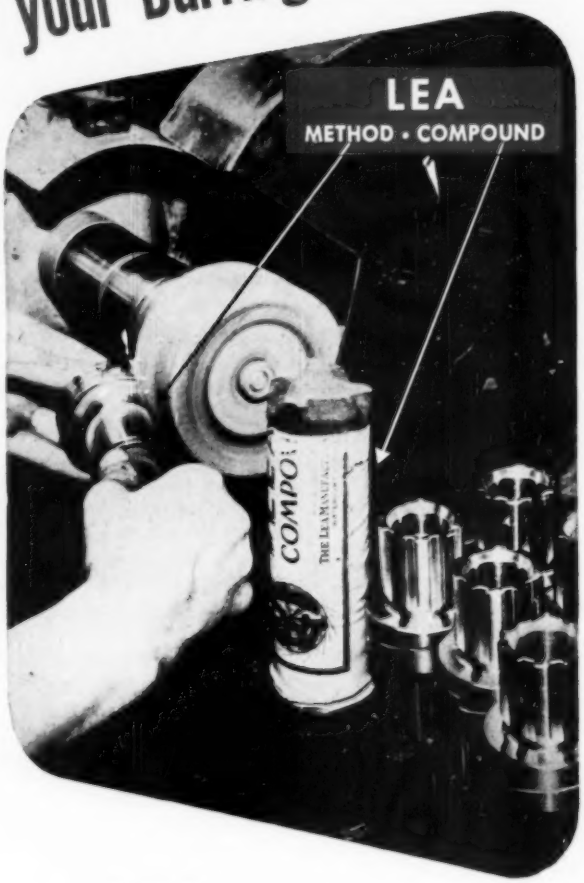

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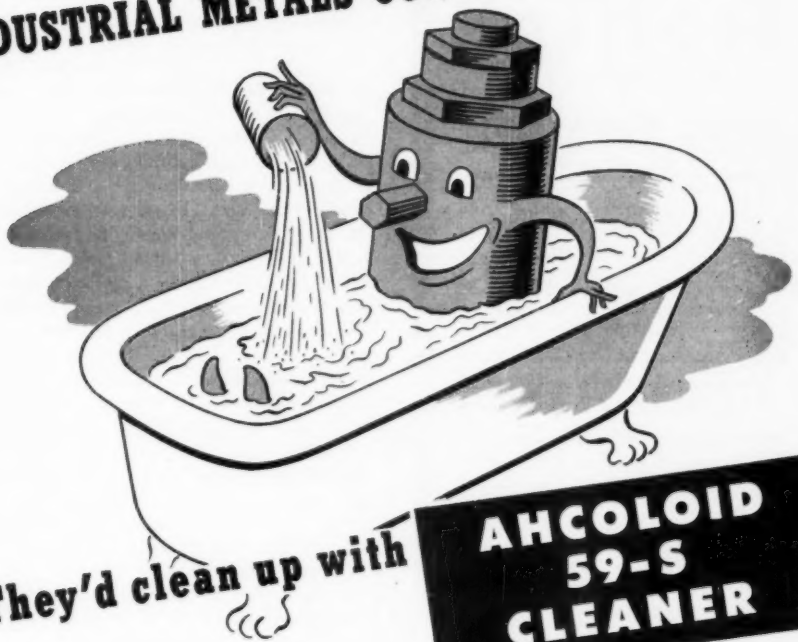

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Article Abstracts

For copies of original articles, turn to your Public Library for photostats or addresses of the publications in question

Protective Metal Finishes for Radio and Electrical Equipment. A. G. Sussex. Dept. Supply and Development Munitions, Supply Laboratories, Commonwealth of Australia, Cir. 9 (March, 1948), 38 pp. Presents a general guide to selection and use of electroplated and chemical surface finishes for protecting the above in tropical areas. Discusses corrosion-protection problems encountered during the New Guinea campaign. Describes methods for coating steel which afford either electrochemical or mechanical protection. Considers the protection of nonferrous alloys.

A New Method for Measurement of the Adhesion of Electrodeposits. M. Bonnemay. J. des Recherches du Centre National de la Recherche Scientifique **1948,** No. 7, 156–160.
After a critical study of three well-known methods, it was concluded that none are entirely satisfactory. Hence a new mechanical method was developed. The apparatus is diagrammed and typical results are charted and tabulated.

The Structure of Electrodeposits; A Review of the Present State of Knowledge. J. J. Dale. Metal Ind. **75,** 355–357 (October 21, 1949); 394–395 (November 4, 1949).
10 ref.

Anodic Polishing. Kurt Schmidt and Otto Kahl. Z. Ver. deut. Ing. **91,** 389–390 (August 15, 1949).
Describes the process and presents information on electrolytes, currents, temperatures, and other conditions required for anodizing iron and steel. The differences between "luster" and "smoothness" are critically discussed. 22 ref.

Conditions for Electrodeposition of a Manganese-Nickel Alloy. D. N. Gritsan and N. S. Tsvetkov. Zhur. Priklad. Khim. **22,** 600–604 (June, 1949).
Experimentally demonstrates possibility of simultaneous deposition of manganese and nickel from sulfate solutions in the presence of ammonium salts. Influence of salt concentration, cathode current density, and *p*H on content of manganese in the electrodeposit were investigated. Results are tabulated and charted.

The Production of Sprays and Mists of Unifrom Drop Size by Means of Spinning Disc Type Sprayers. W. H. Walton and W. C. Prewett. Proc. Phys. Soc. **62,** sec. B, 341–350 (June 1, 1949).
Spray of almost uniform drop size is formed when liquid is fed under suitable conditions onto the center of a rotating disc and centrifuged off the edge. This method of spraying was studied over a wide range of

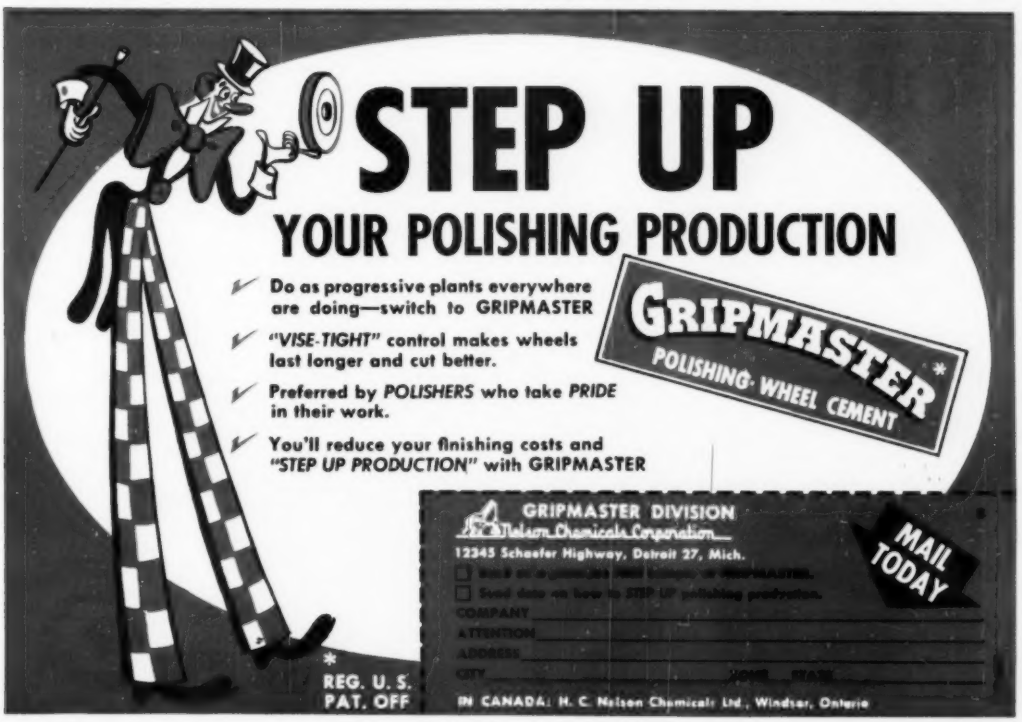
variables, and homogeneous clouds were produced in the drop-size range from 3- to 15-μ diameter. An equation enables calculation of drop diameter from disc diameter and angular velocity of disc.

"Emulsion" Cleaning of Metals. G. Schmerling. J. Electrodepositors' Tech. Soc. **26,** No. 12 (1950).
Elementary theory of emulsion cleaners is explained. In formulating this type of cleaner, many essential points must be borne in mind, seven of which are stated. Essential constituents are (1) solvent, (2) soap, or equivalent, and (3) a blending agent (such as ethylene glyco-monobutyl ether). This mixture may be diluted with more solvent or solvents. It may be used either by the two-stage process: dipping for 2–3 minutes in the non-aqueous mixture and then rinsing or spraying with water, or by the single-stage process: spraying with an emulsion of the cleaner in water. The former is preferred. Considerable information is quoted from U. S. Patent No. 2,032,174 (1933) issued to Carl Johnson.—LYMAN B. SPERRY.

The X-Ray Structure of Speculum Deposits. H. P. Rooksby. J. Electrodepositors' Tech. Soc. **26,** No. 8 (1950).
Experimental work is described which indicates that there are three structural and textural features having an influence on the formation of bright speculum electrodeposits. Details of these features are described. X-ray photographs are presented.—LYMAN B. SPERRY.

Corrosion of Cadmium and Zinc Coatings in Electrical Equipment. P. T. Gilbert and S. E. Hadden. J. Electrodepositors' Tech. Soc. **25,** 41–49 (1950).
Laboratory corrosion tests were made on cadmium plated and on zinc plated steel specimens, some chromated and some not, with results normally to be expected. Certain electrical insulating tapes accelerated and multiplied corrosion manifold. This was shown to be due to the evolution of lower fatty-acid vapors in some cases and to the evolution of alkaline vapors in the case of phenolic resins.—LYMAN B. SPERRY.

Barrel Tumbling of Parts Prior to Finishing. Edward Engel. Tool Engineer **24,** 40–42 (February, 1950).
The article defines barrel tumbling as the removal of scale and burrs and the imparting of some degree of luster to metal by impact and collision with abrasives and lubricants. Three means of securing effective pressure of abrasives on work are listed along with twelve general considerations, including work barrels, abrasives and lubricants, that must be taken into account with barrel tumbling. Tumbling operations from roughing through deburring or polishing to burnish-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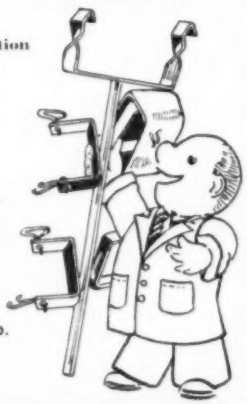

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ing are defined and described. The use of tumbling abrasives and lubricants and their effect on finishes are explained. Types of barrels, speeds, abrasives, lubricants, and chemical additives are described. Accompanying the article are two tables.

Production of Tin Plate. Alfred E. Kadell. Steel **125**, 82 (August 1, 1949), 84 (August 8, 1949), 114 (August 15, 1949).

Gives detailed illustrated description of the two processes in commercial use (hot-dip and electrolytic tinning) including preliminary and succeeding operations. Part I describes precleaning procedures, coiling, annealing, and temper rolling. Part II takes up tinning itself and describes the hot-dip method, as well as following operations, including inspection and packing. Part III describes the alkaline and the acid plating processes.

On the Effect of Surface Atoms, Interference Patterns, and "Active" Patterns on Metal Surfaces. Otto Erbacher. Z. Elektrochemie **53**, 67–75 (March, 1949).

Evaluates the results of several series of experiments made to study the adsorption of metal ions, the process of solution, and electrochemical exchange at metal surfaces. Basic differences between adsorption on platinum and on other metals are described and discussed. Data are tabulated. 14 ref.

Formation of Residual Stresses During Polishing of High-Chromium Stainless Steel. L. A. Glikman, T. P. Sanfirova, and V. A. Stepanov. Zhurnal Tekhnicheskoi Fiziki **19**, 441–447 (April, 1949).

Results of experimental investigation showed that stresses formed during polishing have a thermal origin which may be influenced by volumetric variation related, probably, to phase transformations in certain cases. Similar phenomena occurred during polishing of a stainless-steel plate, for which the diagram of residual stresses differed essentially from the usual diagram.

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High-Frequency Alternating Current. Fr. Muller, W. Eilender, and K. M. Wagner. Arch. Metallkunde **2,** 135–140 (April, 1949).
Two different laboratories investigated independently the claims of the inventor of the Hausner process. Data are graphed and tabulated. Apparatus is diagrammed and illustrated. Includes photomicrographs.

Modulus of Elasticity and Strength of Hard Chromium Coatings. Walter Eilender, Heinrich Arend, and Eugen Schmidtmann. Metalloberflache **3,** sec. A, A145–A147 (July, 1949).
Describes experiments made to determine the above from the results of tensile and bending tests. Heating to 572° F (300° C) reduces the modulus of elasticity from 23,300,000 psi (16,400 kg/mm²) to about 18,500,000 psi (13,000 kg/mm²). The tensile strength of hard chromium was found to be 21,400 psi (15 kg/mm²), but its yield point could not be determined. Data are graphed.

Concerning Different Gold Plating Methods. Otto Loebich. Metalloberflache **1,** sec. B, B55–B57 (July, 1949).
Discusses methods of gold plating for ornamental color effect and for protection against corrosion.

The Electrodeposition of Molybdenum from Aqueous Solutions. Mary Joecile Kaycki L. and F. Yntema. J. Electrochem. Soc. **96,** 48–56 (July, 1949).
Reviews the literature. Presents a general survey of conditions under which deposition of metallic molybdenum was found to occur. 18 ref.

Electropolishing Brass. Willard G. Axtell. Iron Age **163,** 48–51 (June 30, 1949).
Describes bath and process applicable to brass and other copper alloys, as well as to certain high-temperature alloys. Addition of organics to the bath to promote anodic film formation has proved to be the key to successful results. A simple and effective method for evaluating the reflective power of polished articles is also described.

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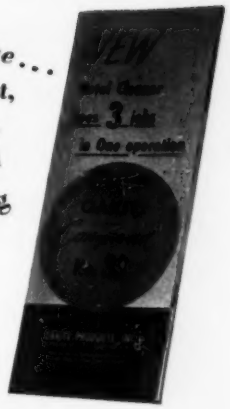

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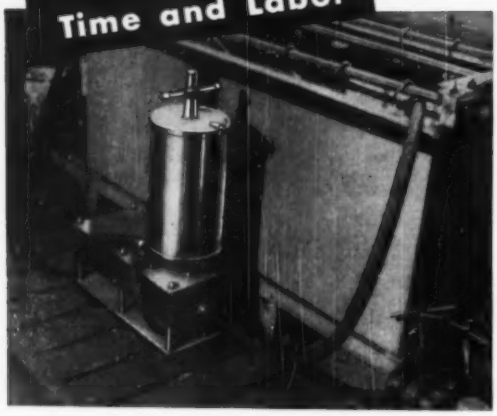

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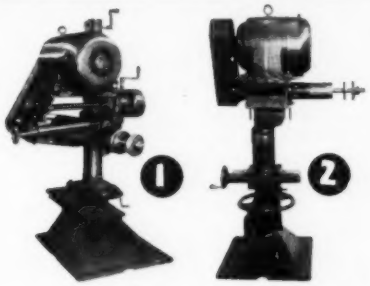

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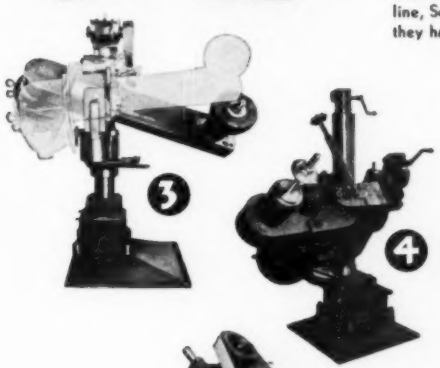

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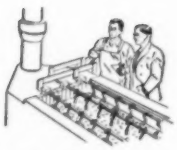

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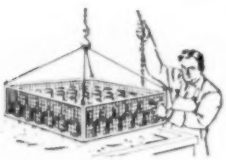

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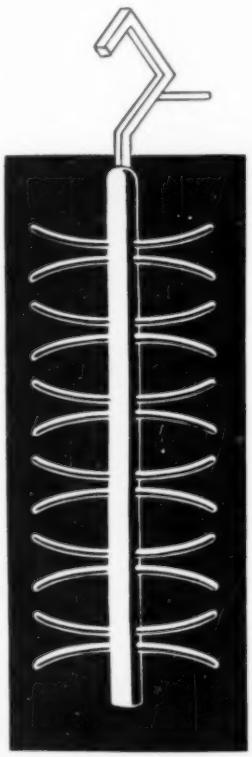
4. *Correct application assured*



More and more companies are discovering how they save time and money with Unichrome Coating 218X. Not only does this green plastisol coating permit racks to be coated faster – and with less labor – but it also cuts the need for subsequent maintenance to the bone. Here's why:

Only a *single* prime coat – Unichrome Primer 219PX – is used with Coating 218X. This system goes through severest plating cycles without loss of adhesion or blistering. It stands chromium plating, hot cyanides, anodizing, hot cleaners–even vapor degreasing. Flexible, and up to 3/16" thick if desired, Coating 218X won't tear or chip with rough handling.

Coating 218X doesn't contaminate, and is approved for use in leading bright nickel baths. In fact, in *all* plating baths this resistant coating aids in preventing contamination caused by drag-in of solutions.

To help you get the maximum toughness and life built into this rack coating, a United Chromium engineer will gladly help you on application procedure. Or, if you have no oven, we'll give you names of nearby, qualified applicators who are job-coating racks with Coating 218X for many other users. Write us.

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Patent Abstracts

GEORGE B. HOGABOOM

Consultant, New Britain, Conn.

Copies of patents may be obtained by writing to Commissioner of Patents, Washington 25, D.C. Price 25 cents each.

No. 2,507,400, May 9, 1950—Method of Electroplating with Iron and Cobalt—F. De Marinis, assignor to S. K. Wellman Company, Cleveland, Ohio.

In carrying out the present invention I also protect the ferrous or other metal surfaces to be bonded by electroplating them with a protective coating, but I have discovered an effective method of doing this with a coating of iron, or iron combined with cobalt, which is capable of being carried out more easily and rapidly and at lower cost than prior methods and which provides the metal body with a surface that bonds well to powdered metal compacts of various compositions.

The ferrous chloride electroplating bath is prepared with the following composition:

$FeCl_2.4H_2O$, g	360
$CoCl_2.6H_2O$, g	21.5
$CaCl_2$, g	180
Water (preferably distilled), l	1
Temperature, °C	70–95
*p*H	1.3–1.5
Current density, asf	10–190

CLAIM 1. A method of protectively coating ferrous and bronze bodies which comprises the steps of providing a water solution of ferrous chloride in a concentration within the range of 250 to 400 grams per liter of water, cobalt chloride in a concentration such that the ratio by weight of the iron to the cobalt in the solution is from 80 to 99.75 parts of iron to 20 to 0.25 parts of cobalt, and calcium chloride in a concentration of 100 to 200 grams per liter; suspending in the said solution as cathode said bodies to be coated, passing an electric current through the solution with a density of from 10 to 490 amperes per square foot to form on the bodies continuous coatings composed of iron and cobalt; meanwhile maintaining the *p*H of the solution within the range of 1.2 to 2.4 and the temperature of the solution between 70 and 95° C; and replacing in the solution metals plated out therefrom to maintain the concentration of the solution.

4 claims.

References cited: U. S. Patents 992,951; 1,544,579; 1,920,964; 1,970,548; 2,036,667; 2,131,427. Trans. Faraday Soc. **28**, 733–740 (1932). "Principles of Electroplating and Electroforming", by Blum et al., (1930), pp. 94, 95, 138. Trans. Electrochem. Soc. **78**, 403 (1940)

No. 2,509,304, May 30, 1950—Method and Apparatus

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- **Acid Type**—Four cleaners for quick, effective removal of rust and scale from iron and steel.
- **Alkaline Type**—Light and heavy duty spray and immersion cleaners. For removal of oil, grease and soil from metal surfaces.

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for Electrolytic Coating of Strip Material—C. J. Klein, assignor to National Steel Corporation.

CLAIM 1. Apparatus for progressively electroplating a continuously moving strip, comprising a plurality of pans across which the strip is passed successively in contact with electrolyte in the pans, said pans being spaced from each other horizontally and disposed side by side at progressively different elevations, each pan being adapted to contain electrolyte and having therein an electroplating anode, means for connecting the anode to a source of electroplating current, conduits connecting each pair of adjacent pans whereby electrolyte flows by gravity from one pan to the adjacent next lower pan, and strip-guiding means in the spaces between adjacent pans for deflecting the strip downwardly as it passes from one pan to the next, said strip-guiding means maintaining the strip horizontally in its passage through said pans and at a predetermined distance from anode in each pan.

6 claims, 6 figures.

References cited: U. S. Patents 594,611; 991,635; 1,271,633; 1,544,506; 1,917,567; 2,093,238; 2,314,369.

No. 2,511,128, June 13, 1950—Plating Rack—A. G Russell, assignor to Western Electric Company, Inc.

CLAIM 7. A plating rack comprising a tubular member having a first wall and a pair of spaced walls extending transversely from said first wall, said spaced walls being provided with aligned apertures for receiving a plurality of articles to be plated in a predetermined spaced relation from said first wall, an elongated electrically conducting leaf spring curved in transverse cross section and longitudinally mounted within said tubular member with its longitudinal edges engaging said first wall and with the curved portion of the spring extending from said wall into the space between the aligned apertures in said spaced walls, said spring being at any point longitudinally thereof independently compressible against said first wall and adapted to engage and yieldingly retain articles through said apertures, and means attached to the tubular member for retaining the spring therein.

7 claims, 6 figures.

References cited: U. S. Patents 197,408; 1,958,539; 1,964,042; 1,965,178; 2,137,819. French Patent 685,608.

No. 2,511,952, June 20, 1950—Process of Plating Zinc on Aluminum—Jesse E. Stareck and Frank Passal, assignors to United Chromium, Inc.

. . . a suitable bath is made up with

$Zn_2P_2O_7$, $3H_2O$, g/l	82
$K_4P_2O_7$, g/l	400
corresponding to	
Zn, g/l	30
P_2O_7, g/l	240

with approximately 0.01–0.1 per cent by volume of an organic polyamine, as for example, diethylene triamine. The bath may also contain about 15 g/l of citric acid to aid anode corrosion. The *p*H of the solu-

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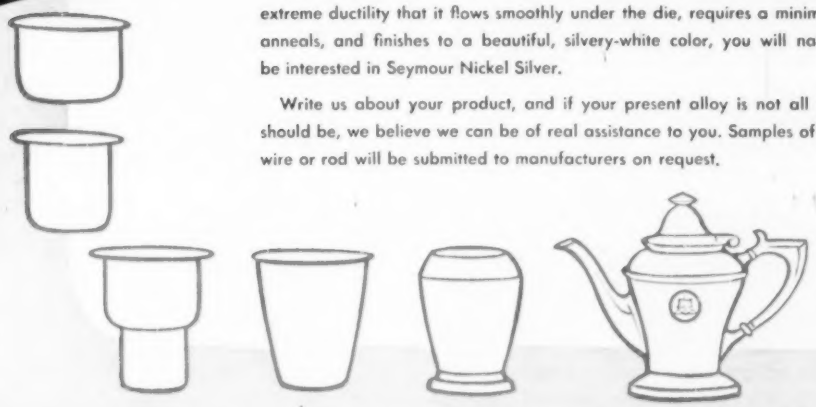

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Patent Abstracts

tion is adjusted and maintained within the range *p*H 8.5 to 9.5.

Air agitation is desirable. A wetting agent and an antifoamant may be used to advantage.

CLAIM. A process of electroplating zinc on aluminum in which a thin coating of zinc is first formed by immersing the aluminum in a zincate solution and zinc afterward electroplated on the immersion coating, characterized by the novel step of electrodepositing zinc cathodically on the zinc-coated aluminum from an aqueous plating solution having a *p*H between 8.5 and 9.5, consisting essentially of a zinc-alkali-metal pyrophosphate complex and 0.01–0.1 per cent by volume of diethylene triamine, said pyrophosphate bath having the property of starting the electrodeposition of zinc under the action of the electric current before the solution acts chemically on the thin zinc immersion coating to expose the aluminum.

1 claim.

References cited: U. S. Patents 744,170; 1,627,900; 2,250,556; 2,355,070; 2,355,505, 2,384,300. Laugbein & Brannt, "Electrodeposition of Metals", 9th ed. (1924), p. 567. Trans. Electrochem. Soc. **88**, 307, 308, 309, 310, 311, 317, 324 (1945).

No. 2,513,859, July 4, 1950—Methods of Electroplating of Tin on Ferrous Strip—Charles E. Glock, assignor to Crown Cork and Seal Company, Inc., Baltimore, Md.

CLAIM 1. The method of electroplating a continuous ferrous strip comprising continuously traveling unplated ferrous strip through an alkaline tin plating bath in which the strip is made the anode for about 2–30 seconds at a current density of about 10–100 amperes per square foot, and then immediately thereafter electroplating the treated unplated ferrous strip with tin in an alkaline tin plating bath of the same composition where the strip is made the cathode.

CLAIM 2. The method in accordance with claim 1 wherein the anodic and plating treatments take place simultaneously but upon successive portions respectively of the continuous traveling strip.

Legend. I employ any customary alkaline tin plating solution for the preliminary treatment of the strip as the anode. For example, a solution containing about 12 grams per liter of sodium hydroxide and about 50 grams per liter of tin gives effective results. Where the treatment of the strip takes place in the plating tank, the temperature of the bath containing such solution is, of course, the temperature employed for plating, namely, about 170 to 210° F, preferably 200° F.

Where the treatment is carried out in a bath separate from the plating tank, a similar solution is used but the temperature may be lower, e. g., about 135–160° F, preferably 140° F. In such separate bath a temperature suitable for plating is not required . . .

References cited: U. S. Patents 1,475,198; 1,533,147;

1,954,473; 2,078,868; 2,437,474; 2,451,341. Trans. Electrochem. Soc. **27**, 141, 142 (1915); **84**, 190, 249-252 (1943). J. Electrodepositors' Tech. Soc. **18**, 24, 27 (1942–1943).

No. 2,514,923, July 11, 1950—Plating Rack—R. T. Balina, assignor to Western Electric Company, Inc.

CLAIM 1. An article-plating rack comprising an upper framework having a centrally depending member, a framework oscillatably mounted on said depending member comprising a pair of yokes pivoted one above the other on said depending member, a pair of spaced-apart bars linked between said yokes, said bars having article-supporting members for supporting an article in position across a supporting member on each bar, means for limiting the sliding of articles being held by said supporting members, link members pivoted to the upper framework and means carried on said upper framework and engagable with said link members for rigidly holding said oscillatable framework in any one of a plurality of positions with respect to said upper framework.

4 claims, 5 figures.

References cited: U. S. Patents 1,010,647; 1,165,917; 1,427,875; 1,747,165. German Patent 152,724.

No. 2,515,148, July 11, 1950—Method of Preparing Ferrous Metal for Heat-Treatment—Hugh G. Webster and John H. Shoemaker, assignors to Kolene Corporation, Detroit, Mich.

CLAIM 2. In preparing metal stock for heat treatment preliminary to forging, the method comprising immersing a scale and oxide coated ferrous metal workpiece in a molten salt bath consisting essentially of a fused mixture of sodium hydroxide, sodium chloride and sodium aluminate in approximate proportions by weight of 85 parts of sodium hydroxide, 10 parts sodium chloride and 1 part sodium aluminate, directing successively reversed currents into the bath until the surface of the workpiece is converted to a superficial layer of substantially pure ferrite and then plating the workpiece with a metal selected from the group of nickel and copper.

3 claims.

Legend. If the casting has sand on its surface, the sand may be removed first by the anode-oxidation step. About 4 per cent sodium fluoride is included in the bath; this will affect the sand to form silicon fluoride, which is a gas and escapes, or to form sodium silicate. Thereafter the cathode reduction step may be applied to eliminate scale if scale is present.

The temperature of the bath may be between 600° and 1000° F but the optimum results have been obtained at 850°–900° F.

The electric current is slow alternating or slow successively reversed direct, of 4 to 6 volts, with an intensity of 50 amperes per square foot. . . . five minutes has proven satisfactory for oxidizing and ten to thirty minutes for reduction.

References cited: U. S. Patents 1,909,119; 2,261,744;

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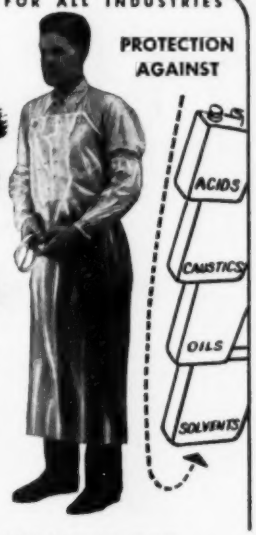

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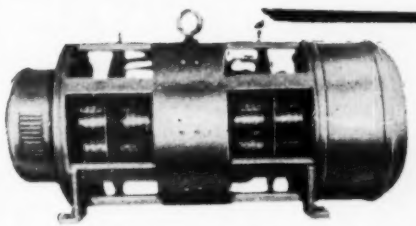

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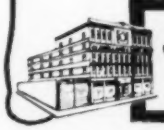

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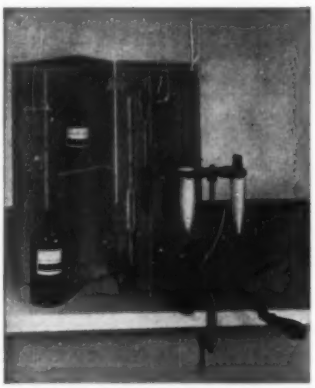
for determining

Sulfates in Chromium Solutions



This apparatus enables anyone to accurately and quickly determine the sulfate content of a chromium plating solution.

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2,353,026; 2,468,006. British Patents 442,859; 105,027. Metals Handbook, 1936 ed., pp. 785–787. Iron and Steel 501–505 (June, 1944).

No. 2,516,227, July 25, 1950—Electroplating of Chromium Molybdenum Alloys—C. C. Ma, assignor to Westinghouse Electric Corporation.

Object of my invention is to plate alloys of chromium and molybdenum from aqueous solutions, such alloys to contain from 1 to 30 per cent molybdenum, . . . to coat base metal, such as copper and iron, with a dense, closely adherent plating of an alloy such as chromium-molybdenum, which is highly resistant to oxidation and the corrosive action of chemicals.

CLAIM 1. The method of electroplating comprising dissolving chromic oxide in from 6 to 7 times its weight of water, dissolving molybdenum trioxide equivalent to about 1/3 the weight of the chromic oxide in said solution, adding sulfuric acid equivalent to about 1 per cent of the weight of the chromic oxide, heating to a temperature up to 40° C, and passing electric current therethrough using a base metal cathode and an anode of molybdenum, and continuing the passage of said current for about five hours to form a deposit on a cathode of a molybdenum-chromium alloy containing from 1 to 30 per cent of molybdenum in closely adherent form.

2 claims, 1 figure.

References cited: U. S. Patents 1,365,499; 1,581,188; 1,717,468; 1,782,092; 1,795,459; 1,885,700; 1,993,020; 2,332,116; 2,392,821. British Patents 240,190; 286,457. J. Am Chem. Soc. **54,** 3775–3776 (1932). Trans. Electrochem. Soc. **70,** 423–429 (1936).

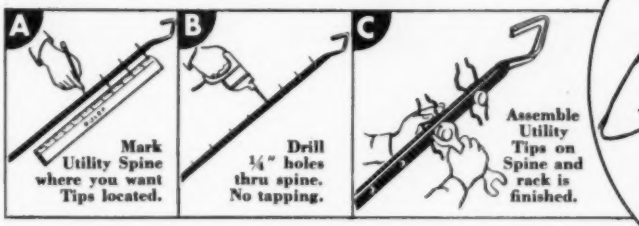
No. 2,516,515, July 25, 1950—Method for Making Iron Powder—Max F. W. Heberlein, assignor to The American Metal Company, Ltd.

CLAIM 10. A process for electrolytically making iron powder suitable for compacts (sintered-powder parts—EDITOR) which comprises employing an electrolytic cell comprising a stainless-steel cathode, an anode of soft-steel sheet, and an electrolyte consisting essentially of an aqueous solution of ferrous perchlorate having a concentration of about 35 grams iron per liter, subjecting the contents of the cell to electrolysis at a *p*H within the range of about 4.0 to about 4.5, at a current density of about 35 amperes per square foot of cathode area, with a cell voltage within the range of about 1.4 to about 1.6; stripping the cathode deposit, and washing it twice each time with an amount of water equal to the weight of deposit; drying the washed deposit; grinding and screening the resulting material; treating the screened material in an atmosphere of hydrogen at temperatures within the range of about 1150 to about 1400° F; and disintegrating the reduced material to iron powder of a size suitable for use as compacts.

10 claims.

References cited: U. S. Patents 931,944; 1,516,326; 2,287,082; 2,389,731. German Patents 126,839; 316,748.

Efficient Racks For Any Job In A Matter of Minutes


A
Mark Utility Spine where you want Tips located.
B
Drill ¼" holes thru spine. No tapping.
C
Assemble Utility Tips on Spine and rack is finished.

With a supply of *BELKE Utility Spines and Tips* on hand, it's that simple—that fast—that easy to have *complete racks* designed for your job, whether chrome or any other plating.

Universal Plastic Coating on Utility Spines and Tips withstands all cleaning and plating cycles. You space Utility Tips the way you want them. They join the spine with a leakproof seal, yet are easily changed or respaced on the spine. The five Utility Tip models have been developed in collaboration with experienced platers to efficiently handle 90% of all plating jobs. All models have spring pressure contacts for copper-nickel-chrome plating.

BELKE VAC-SEAL REMOVABLE TIP DESIGN

Flexible, Cup-like Collar of Universal Plastic is forced against spine coating, forming a leak-proof union. (pats. pend.)
Spines and Tips Coated with Universal Plastic. Withstands all plating cycles.
Drill ¼" hole thru coated spine. No tapping. Will not injure coating.
Tapered Nut tightens against spine metal to support tip, assuring positive contact. (pats. pend.)
Knurled Shank is drawn into spine metal. Tips cannot twist or turn. Positive contact is assured. (pats. pend.)
Threaded Lucite Cap encloses nut. (pats. pend.)

BELKE UTILITY SPINES

$2.85 ea.

30" and 36" lengths. Fabricated from ¼" x ⅝" round-edge copper stock with thick coating of BELKE Universal Plastic.

FIVE UTILITY TIP STYLES

Only 4 most popular shown. Other styles to specifications. All styles coated with Universal Plastic.

Plating Rack Economy Never Before Equalled

BELKE Utility Racks give tremendous service life. The Removable, Interchangeable Tips enable you to use them over and over again on countless jobs of every description. When holes in Utility Spines are not in use, BELKE Removable Plugs can be used to seal out solutions.

What's more, BELKE Utility Racks cost you half as much as specially designed racks.

Immediate Delivery. Write for complete prices and specifications — or consult your BELKE Service Engineer.

Belke MANUFACTURING CO.
947 North Cicero Ave.
Chicago 51, Ill.

EVERYTHING FOR PLATING PLANTS

BRIGHT, PROTECTED ZINC

A large percentage of all zinc coated refrigerator shelving is made more decorative and durable with the Promat Pro-Seal Finish. This outstanding finish gives zinc an incomparable brilliance and corrosion resistance. It is designed for use where quality and appearance are the primary consideration. Other Promat products include addition agents, purifiers and brighteners for zinc plating. Details on request.

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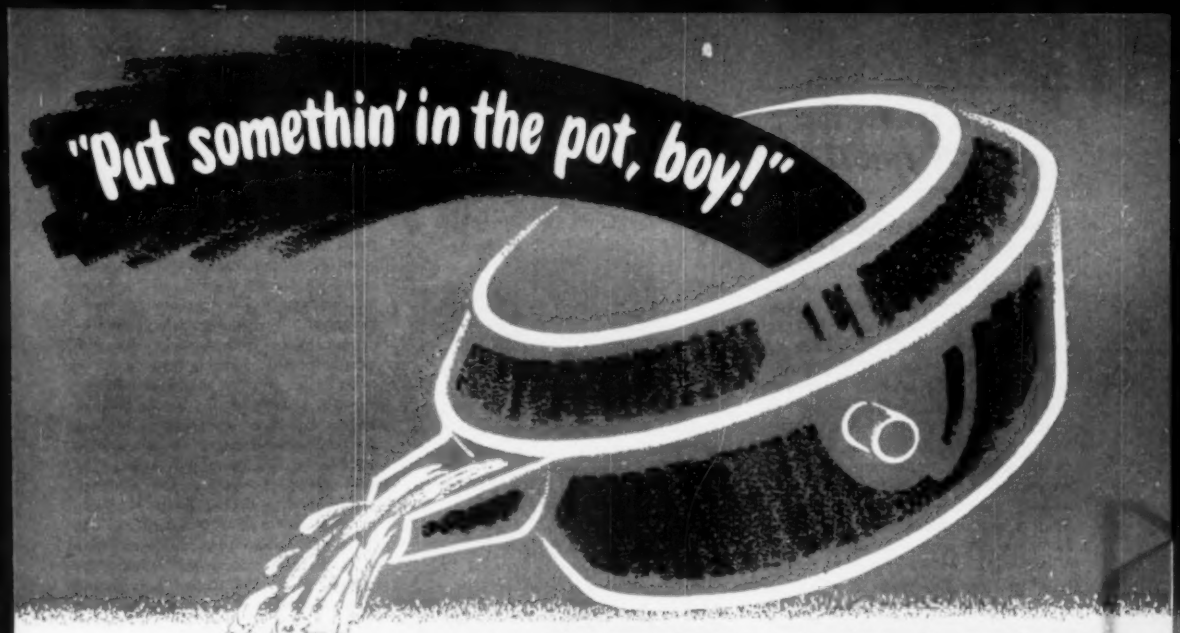
851 South Market Street, Waukegan, Illinois

*Pro-Seal** **FINISH**

*Reg. U.S. Pat. Off.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 969.



. . . and get NEW ANODES from YOUR NICKEL SCRAP

You can beat the nickel famine!

Dig into that nickel mine in your scrap bins. Send us those ends, swords, stubs — any nickel anode scrap. We'll cast your own metal into new oval anodes, drill and tap for hooks and ship to you pronto. You paid for this metal; why not use it? It represents a reliable source of nickel at this time and the cost of re-conversion is low. Wagner Brothers, Inc., has installed the finest melting and casting equipment available and your metal is processed under stringent metallurgical control. We're centrally located, easily reached at low transportation cost.

To handle a large volume of metal efficiently, we recommend a standard ordering and shipping procedure. Just fill out the coupon in detail and we'll send full directions for packing and shipping, and quote on any quantity.

Wagner BROTHERS INC.

MIDLAND • DETROIT 3, MICH.

We have electrolytic nickel anode scrap for re-conversion.

Stubs, average length _____ **inches**
Weight (less hooks) _____ **pounds**
Swords, average length _____ **inches**
Weight (less hooks) _____ **pounds**

Shipment can be handled in

☐ **Strapped bundles** ☐ **By Rail**
☐ **Drums** ☐ **By Truck**

NAME _____
TITLE _____
COMPANY _____
ADDRESS _____
CITY _____ **ZONE** _____ **STATE** _____

Equipment and Supplies

E—536. Pocket Volt-Ammeter—A new pocket-type instrument, Amprobe, manufactured by Pyramid Instrument Company, 49 Howard Street, New York 13, N. Y., measures current without interrupting service. It is 7⅛ x 2 $\frac{5}{16}$ x 1⅛ inches and weighs only 12 ounces. A plastic finger trigger opens the transformer prober and clamps it around the conductor to measure current. To measure voltage a pair of test leads are inserted into the front-mounted pin-jacks and connected to the line. The transformer probe jaws are insulated with a 1/16-inch cover of molded nylon, which prevents shorts when measuring noninsulated conductors. Jaws, specially shaped to get into tight places, will handle conductors up to 1½-inch diameter. The Amprobe is available in two models, each with seven ranges. Model A-5 is 6.5/13/26/65/130 amperes and 130/260 volts. Model A-6 is 10 25 50/198/250 amperes and 150/600 volts. For further information, use Reader Service Card.

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the tank. It is available in all sizes, in stainless steel, aluminum, or copper. A lead lining is available when desired.

The Company also features a weldless 16-tumbler rack designed for use in anodizing tanks measuring 18 inches wide by 42 inches deep. Use of the racks is said to eliminate poor conductivity, increasing rack service by 50 per cent. Racks are fabricated from ⅜ x ¾-inch 24 ST aluminum. For further information, use Reader Service Card.

E—538. New Plastic—Development of a tough new plastic "Enrup", which promises to become one of the basic raw materials of the rubber industry, has been announced by United States Rubber Company. The new plastic, which is said to bridge the gap which has existed between soft rubber and hard rubber for almost a century, is a high-strength material, which is resistant to abrasion and chemicals and at the same time can be produced in varying degrees of flexibility.

One of its outstanding uses is for the manufacture of high-strength, low-cost gears to replace metal gears in such applications as plating barrels. Its resistance to the newer type of synthetic detergents has given it an advantage over metal. Resistance to cold acids is said to be excellent; to hot nonoxidizing acids, good; to cold alkalies, good; to hot alkalies, fair; to solvents, excellent; to gasoline, good. Among the other promising applications are buckets for carrying chemicals, plating barrels, filter-press plates, and low-load, low-speed bearings and bushings. It is now in production in two company plants located at Fort Wayne, Ind., and Passaic, N. J., and is available in the form of sheets, rods, tubes, gear blanks, and molded parts. For further information, use Reader Service Card.

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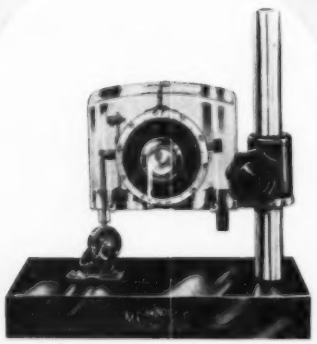
MEASURE THICKNESS OF COATINGS ON METALS THE EASY, ACCURATE WAY



Amico Brenner MAGNE-GAGE

FOR MEASURING THICKNESS OF NON-MAGNETIC COATINGS ON IRON OR STEEL AND NICKEL COATINGS ON IRON, STEEL, OR ANY NON-MAGNETIC MATERIAL

The Magne-Gage is a versatile, easy-to-use instrument for accurately measuring coatings on convex, concave, or plane surfaces, without destroying either the coating being measured or the base material. Modified Magne-Gages can be supplied to measure coatings on inside surfaces of tubes, pipes, etc. Less than 45 seconds are required to take a reading, and an accuracy of better than 10% full-scale is assured. Operation is based on the magnetic attraction of a permanent magnet to the material being measured and/or its backing, thus no electrical circuits are involved and no auxiliary equipment is required.

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Coating on Cylindrical Object Being Measured with the Magne-Gage

AMERICAN INSTRUMENT CO., INC.
8030 GEORGIA AVENUE SILVER SPRING, MARYLAND

Offering outstanding economy and simplicity of solution control, the process may ordinarily be used in any existing spray-washing setup of three or more stages without modification of established equipment or production lines.

Three operations are performed simultaneously: removal of soil and dirt without use of additives, often eliminating precleaning; application of a firm paint bond; inhibition of rusting, usually eliminating the final chromic acid rinse. For further information, use Reader Service Card.

E—540. Wax Activator—An efficient spreading agent, "Paraspred", for paraffin and microcrystalline waxes is now in full commercial production in the plant of the Glyco Products Company, Inc., 26 Court Street, Brooklyn 2, N. Y. In addition to its spreading properties, Paraspred plasticizes paraffin wax improving its adhesiveness. As little as 1 per cent added to paraffin wax causes it to spread readily even on damp surfaces, 10 per cent plasticizes paraffin wax to give very flexible, thin coatings of wax. For further information, use Reader Service Card.

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The wax dries tack-free in less than ten minutes, is easy to apply by dip, brush, spray or wipe-on methods, and coats approximately 2,000–2,500 sq.ft per gallon. For further information, use Reade r Service Card.

E—542. Solvent Emulsion Cleaner—Chemclean Products Corporation, 64 Sixth Avenue, New York 13, N. Y., offers a self-emulsifying solvent called "S.E.C.", which is said to have particularly fast-wetting, rapid-penetrating, and free-rinsing properties.

Used as a pre-soak, it is claimed to remove quickly impacted buffing compounds, drawing oils and compounds, sulfurized and chlorinated cutting oils, greases and soaps without attack on any metal or alloy. Nontoxic and practically odorless, it is safe and simple to use and compatible with alkaline cleaners and chlorinated degreasing solvents. Can be used at from room temperature to 140° F, either as is or in the form of an emulsion with 1–2 parts of water for immersion or up to 20 parts of water for spray application. For further information, use Reader Service Card.

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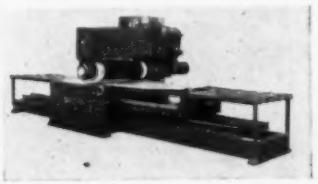

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METAL

Soil to be removed

EQUIPMENT Available

FINISH to be Applied

Handling Difficulties

Do You have a Specific Problem

Metal finishers have problems that require careful and thorough study by experienced technicians. And just as the specialist diagnoses disease, so our technical men in the cleaning field analyze and help solve the hard problems of metal finishing.

Check over the list of difficulties outlined above and send it to us for a report on your specific case.

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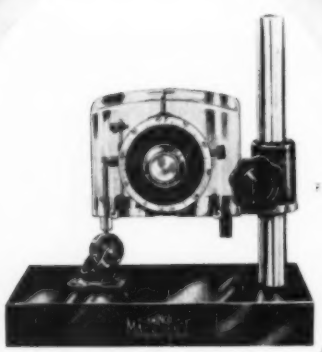

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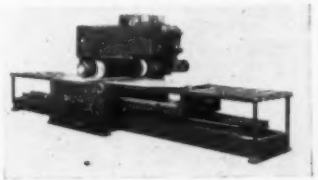

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AVAILABLE FOR IMMEDIATE SHIPMENT ATTRACTIVE VALUES

THE FOLLOWING EXCELLENT REBUILT AND GUARANTEED ELECTROPLATING MOTOR GENERATOR SETS AND RECTIFIERS, WITH FULL CONTROL EQUIPMENT:

1—15,000/7500 AMPERE 6/12 VOLT **COLUMBIA ELECTRIC CO.** with Separate M. G. Exciter.

1—10,000/5000 AMPERE, 6/12 VOLT **HANSON-VAN WINKLE-MUNNING CO.** Separately Excited. Synchronous Motor. Excellent Condition.

2—7500/3750 AMPERE, 8/16 VOLT **HANSON-VAN WINKLE-MUNNING CO.** Separately Excited. Synchronous Motor.

1—6000/3000 AMPERE, 6/12 VOLT **CHANDEYSSON ELECTRIC CO.** Synchronous Motor Drive, Exciter-in-Head.

1—5000/2500 AMPERE, 6/12 VOLT **MUNNING** "OPTIMUS." Separately Excited.

1—3000/1500 AMPERE, 6/12 VOLT **CHANDEYSSON ELECTRIC CO.** Synchronous Motor. Exciter-in-Head.

1—3000/1500 AMPERE, 6/12 VOLT **ELECTRIC PRODUCTS CO.** Synchronous Motor. Separately Excited.

1—2000/1000 AMPERE, 12/24 VOLT **HANSON-VAN WINKLE-MUNNING.** Separately Excited.

1—1500 AMPERE, 12 VOLT **COLUMBIA ELECTRIC CO.** Exciter-in-Head.

1—1250 AMPERE, 15 VOLT **COLUMBIA ELECTRIC CO.** Exciter-in-Head.

3—1250 AMPERE, 15 VOLT **COLUMBIA ELECTRIC CO.** Exciter-in-Head.

2—1000/500 AMPERE, 6/12 VOLT **CHARLES J. BOGUE ELECTRIC CO.** Separately Excited. Interpole Design. Exciter-in-Head.

1—750 AMPERE, 12 VOLT **CHANDEYSSON ELECTRIC CO.** Synchronous Motor. Exciter-in-Head.

1—1500 AMPERE, 40 VOLT **HANSON-VAN WINKLE-MUNNING** Anodizing Synchronous MG Set. Automatic Controls. Exciter-in-Head.

1—1000 AMPERE, 40 VOLT **HANSON-VAN WINKLE-MUNNING CO.** Anodizing Synchronous MG Set. Exciter-in-Head.

1—1000 AMPERE, 25 VOLT **HANSON-VAN WINKLE-MUNNING CO.** Separately Excited. Anodizing Unit.

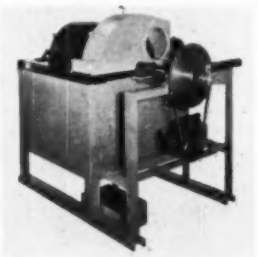
OTHER SIZES OF ELECTROPLATING AND ANODIZING MOTOR GENERATOR SETS IN STOCK.

4—**G. E.** COPPER OXIDE RECTIFIER, 500 AMPERE, 6 VOLTS, for operation on 220/3/60.

3—**HANSON-VAN WINKLE-MUNNING** COPPER OXIDE RECTIFIERS, 500 AMPERES, 6 VOLTS, with 220/440 volt, 3 phase, 60 cycle input. **SPECIAL . . .**

M. E. BAKER CO.
25 WHEELER STREET
CAMBRIDGE, MASS.

E—544. Chromium Plating Barrel—Now available for prompt delivery from United Chromium, Inc., 100 E. 42nd Street, New York 17, N. Y., is the 24-inch, batch-type Unichrome Chromium Plating Barrel. Used for hard and decorative plating of small parts, which are



expensive or difficult to plate in baskets or on racks, this barrel is said to assure lower-cost plating with fewer rejects.

The insulated steel cylinder of the barrel is 24 inches in diameter and 20 inches long and mounted in a 150-gallon insulated steel tank with all bearings, connections, and brush contacts made outside the barrel. The cylinder is rotated by an electric motor through reduction gears, while the anode is stationary inside the cylinder. Temperature-control coil, electric stirrer, exhaust hood, unloading device, and drip pan are included. The capacity of the barrel depends upon the size and shape of the work. Approximately 5,000 ½-inch long wood screws weighing 10 pounds can be plated in 10 minutes.

A special Unichrome Self-Regulating High Speed Chromium Plating Solution, normally requiring no chemical analysis, is used in the barrel. For further information, use Reader Service Card.

E—545. Imported Plating Chemicals—Armida Products Company, 15 Whitehall Street, New York 4, N. Y., now offers a line of imported plating chemicals at prices considerably below U. S. market. All products are said to meet the highest specifications of the electroplating industry. In plating tests, the Armida cyanides are claimed to compare favorably with standard U. S. commercial material. Mention PLATING when making inquiries.

E—546. Water Dispersible Metal Buffing and Coloring Composition—Hanson-Van Winkle-Munning Company, Matawan, N. J., has developed a water-dispersible buffing and coloring composition, No. 4-S-10, which is said to be easily removed in a mild alkaline cleaner with or without current and to be especially useful for work with deep filigrees which tend to trap composition into tight, hard masses.

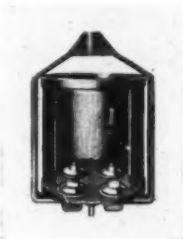
No. 4-S-10 is a general purpose material for color buffing of all nonferrous metals except nickel. For further information, use Reader Service Card.

E—547. Nonsludging Aluminum Etching Compound—Pennsalt AE-18, a highly concentrated alkaline compound for uniform etching of aluminum without formation of hard deposits on the bottom of the etching tanks, is now being offered by the Special Chemicals Department of the Pennsylvania Salt Manufacturing Company, 1000 Widener Building, Philadelphia 7, Pa., after extensive field tests.

Packaged in a 300-pound nonreturnable drum, it is recommended in concentrations of 5–7 oz/gal at 140–150° F. Depending upon the degree of etch desired, the parts may be immersed for ½–10 minutes, followed by rinsing in a clear water, dip or spray. For titration chart and other information, use Reader Service Card.

E—548. Polishing Materials—The Lea Manufacturing Company, Waterbury, Conn., announces two new products: (1) Leabrament, a greaseless, nonflammable, quick-drying liquid abrasive for burring and polishing, available in grit sizes from 100 to fine micron. It can be sprayed or brushed on polishing and buffing wheels and is suitable for hand or automatic production methods, also for renewing worn abrasive belts; (2) Leament, a liquid polishing cement characterized by flexibility and long life. It can be sprayed or brushed on the wheel prior to heading up with loose abrasives. Both products are available in 5-, 30-, or 50-gallon containers. For further information, use Reader Service Card.

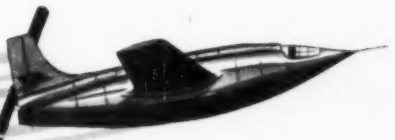
E—549. Plating Barrel—The Daniels Plating Barrel and Supply Company, 129 Oliver Street, Newark, N. J., announces an improvement on all standard type OLS plating barrels. The OLS contact



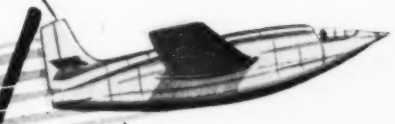
frame pictured here, which supports the perforated cylinder and carries current to the parts through the chromium plated contact studs, has heretofore been made of cast iron, insulated with semihard homogeneous rubber. It is now made of cast aluminum, insulated as before, with the advantages of more current being carried to the work because of lower internal resistance and less operator fatigue, while strength and rigidity are being maintained.

JETAL

A PROTECTING BLACK FINISH



JET Black!



JET Fast!

On in Just 5 Minutes!

For IRONS AND STEELS

Easy to use . . . goes on by immersion bath (no current) JETAL gives more protection — greater wear resistance — consistent quality, added toughness, longer life!

JETAL will not chip, peel or crack off or dust off even if bent or cut.

JETAL *costs* less!

"JETALIZE" irons and steels in bulk, in baskets or in barrels.

For additional protection, after the JETAL process, apply JETOIL 1A, the all-around, oil-type after coating.

Get your iron or steel samples JETALIZED without cost . . . or ask for a JETAL demonstration in your plant.

ALROSE CHEMICAL CO.

Originators of Black Oxide Finishes In The U.S.A.

PROVIDENCE, RHODE ISLAND • WIlliams 1-3000 - 1-3001

Equipment and Supplies

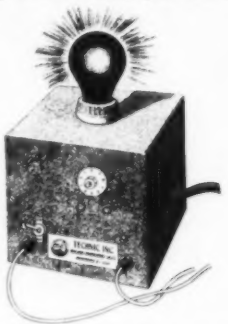
By using the aluminum contact frames together with various other component parts of aluminum, the manufacturer has been able to produce the No. 4 OLS barrel with only two counter weights instead of three; still the lifting power required for loading and unloading is less than before. For further information, use Reader Service Card.

E—550. Oxidizing Liquid—A liquid which is said to produce oxidation rapidly and with better results than ordinary chemicals, such as sulfuret, liver of sulfur, or their substitutes, is offered by the Hanson-Van Winkle-Munning Company, Matawan, N. J. By adding ¼ fluid ounce of concentrated H-VW-M Oxidizing Liquid to each gallon of water, an oxidizing solution may be made for copper, bronze, and silver. This solution, which is said not to deteriorate, may be used hot or cold, but faster operation is obtained when hot. For further information, use Reader Service Card.

E—551. Protective Oil Spray—Originally designed for use on guns, a new type of rust-preventive oil and lubricant known as "Gun Guard", packaged in an Aerasol container for spray application to metal parts in storage and production, has been introduced by The Mitchell-Bradford Chemical Company, 2446 Main Street, Stratford, Conn.

It is said to be ideal for industrial use due to the speed and ease with which it can be applied without the necessity of having to lift or move the items to be treated. The oil is of a polarized type and will displace moisture on the metal surfaces. For further information, use Reader Service Card.

E—552. Plating Timer—Technic, Inc., Providence, R. I., has announced the development of an automatic timing control, called the "Technic-Timer", for the plating from rhodium, gold and gold-



alloy solutions. The 6-inch-cube unit is set up and operating in less than a minute. The operator sets the dial for the desired plating time and insertion of the work in the tank automatically starts the timing. Completion of the cycle is signalled by a red light. Removal of the work automatically resets the timer to the same cycle, ready for the next batch.

Model OM, 110-volt A.C., supplies 1-60-second cycles; other models are available for longer plating cycles. For further information, use Reader Service Card.

E—553. New Demagnetizer—A demagnetizing coil of improved design has recently been announced by the Special Products Division of the General Electric Company, Schnectady 5, N. Y.

The G-E demagnetizer is shipped complete and ready for use. It consists of an air-core coil built in a frame which can be mounted on any table or bench. The coil is rated at 115 volts, 60 cycles, and is equipped with switch, pilot lamp, and a flexible lead fitted with a standard plug. It has a rectangular opening 4½ x 8½ inches to accommodate stock up to 8 inches wide. The coil axis being horizontal, mass production demagnetizing may be accomplished by passing a nonmetallic conveyor belt through the instrument parallel to the coil axis. For further information, use Reader Service Card.

E—554. Fire-extinguishing Nozzle—A new type of 3-way fog nozzle, said to extinguish oil, electrical, paint, and many other types of fires with the least possible water, has been announced by Bete Fog Nozzle, Inc., Greenfield, Mass. This Bete G-5 Fire Nozzle can be changed from full fog through straight stream to complete shut-off by a turn of the handle and produces more fog at lower pressures, yet is self-cleaning and practically nonclogging. For further information, use Reader Service Card.

NO SHUT DOWN

to carbon treat solution with . . . horizontal

SPARKLER horizontal plate FILTERS

SPARKLER *plate* FILTERS

Only a few minutes are required to lift out the horizontal plate assembly in a Sparkler Filter and drop in a clean set of filter plates and production is under way without appreciable interruption.

Tanks are given a carbon treatment without shutting down production in the battery installation shown here. One or two filters are cut out of the line, drained, cleaned and dressed with clean filter papers. The proper amount of carbon is mixed with water in a stand-by tank and recirculated through the filters thus depositing the carbon on the plates in a cake of uniform thickness and density. The solution requiring a carbon treatment is then circulated through the carbon beds giving the plating solution the carbon treatment without contaminating the tank or stopping plating operations.

Sparkler Horizontal Plate filters give absolutely sharp filtration at all stages of the cycle.

A battery of 18 Sparkler Filters in one of the largest bright nickel plating plants in the world.

SPARKLER MANUFACTURING CO.
MUNDELEIN, ILLINOIS

E—555. Self-Priming Pump—Goulds Pumps, Inc., Seneca Falls, N. Y., has announced a new line of self-priming centrifugal pumps, in which all valves are eliminated by the unusual design. Other

advantages are said to be: positive self-priming, no large and bulky priming reservoir, no recirculation of water during pumping stage, and efficiencies comparable to standard centrifugal pumps. The pumps are made in sizes from ¼ to 5 hp, open and closed impellers in capacities up to 120 gpm and heads up to 135 feet, depending on capacity. Suction lifts up to 25 feet. For further information, use Reader Service Card.

E—556. Chemically Pure Water—To meet the need for small amounts of chemically pure water where elaborate equipment would be too costly, the LaMotte Chemical Products Company, Towson 4, Baltimore, Md., has designed the New LaMotte Filtr-Ion Unit. Made entirely of plastic and entailing no installation or operation cost, it may be used continuously or intermittently.

The raw water is passed through a bed of specially prepared and adjusted deionizing resin, thereby producing chemically pure water of the quality of triple-distilled water with a *p*H of about 7.0. Each unit will deliver up to 10 gallons, depending on the mineral content of the raw water supply. For further information, use Reader Service Card.

E—557. Emptying Stainless Steel Acid Containers—Safe and convenient transfer of acids and other liquids from stainless steel containers is claimed for the

GS No. 17 pump manufactured by General Scientific Equipment Company; 2700 W. Huntingdon Street. Philadelphia 32, Pa. Liquids flow smoothly and stop instantly. They come in contact only with the corrosion-resistant tube made of lead or Saran. The pump is fitted with a safety valve for air-line pressure, a hold-down clamp to secure the pump into the container, and 25 feet ⅜-inch air hose with male or female coupling and chuck attached. For further information, use Reader Service Card.

E—558. Tote Box—United States Rubber Company, Rockefeller Center, New York 20, N. Y., has announced a new type of stacking and nesting tote box, that is formed in one seamless piece from the company's Royalite thermoplastic material. Handles are formed into the roll of the upper lip so that the tote box can be picked up from any side, and all corners are rounded.

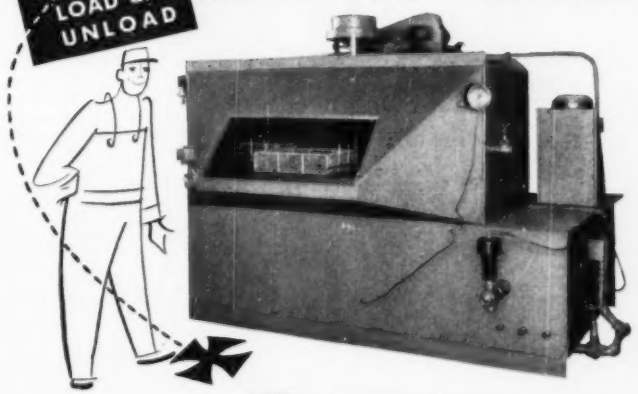
The tote box is designed for criss-cross stacking, with adequate locking when boxes are stacked. Contents of each can be easily seen when stacked. The material is said to be extremely tough with high resistance to impact, acid-resistant, nontoxic, and have a lower water absorption, less than ½ per cent. For further information, use Reader Service Card.

E—559. Lightweight Colored Aluminum Chain—A group of styled chains, made of aluminum and finished by means of the Mirrodip JF Electrodized process to simulate gold, silver, nickel, brass, copper, chromium and in red, blue, gray, green, brown, black, and the various pastel shades, has recently been developed by Colonial Alloys Company, Philadelphia 29, Pa.

The finished chain surfaces are said to have a much higher corrosion resistance and to outwear any electroplated or lacquered finish. The simulation of the color of any karat of gold is said to be so close that it is difficult even for an expert to recognize the difference at first sight. For further information, use Reader Service Card.

ONE MAN OPERATION with BLAKESLEE METAL PARTS WASHERS

ONE SPOT LOAD and UNLOAD



BLAKESLEE SOLVENT VAPOR DEGREASERS —economical, efficient— USE LESS SOLVENT

BLACOSOLV Stabilized Degreasing Solvent — one price, one solvent *for all metals*

Blakeslee's new washer saves labor, is economical

Just one man can keep the production line going with this time saving metal parts washer. Turn table operation permits loading and unloading in one easy pivot movement. One revolution of the washer turn table and parts come out sparkling clean for a better finishing job with fewer rejects. Blakeslee washers are designed for every type and size of plant operation. Write for the cooperative services of our engineer-trained sales representatives.

G. S. BLAKESLEE & CO.

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Branch News

CHICAGO BRANCH

The forty-four members and guests present at the meeting on June 22 enjoyed hearing PAUL GLAB and J. M. ANDRUS report on the Boston Convention activities. They were most pleased to learn that the Chicago Branch had been awarded first prize for the best exhibit, that Branch members KLEM PETROSIUS and ART BARTMAN had received first prize for the best individual exhibit, and that the exhibit sponsored by J. M. ANDRUS had received honorable mention.

The speaker was MR. EDWARD I. PETERS of Pontiac Engraving & Electrotype Company, who talked about "Electrodeposition in the Graphic Arts". It was revealing to many to hear of the great interest in plating in the graphic arts and to realize that physical properties of the deposits in this industry are of primary importance, brightness and corrosion resistance not being considered. The talk was exceptionally well prepared. Following Mr. Peter's presentation, a lively interchange of questions and answers took place.

RAYMOND F. LEDFORD,
Correspondent

CINCINNATI BRANCH

The annual picnic was held on July 7 at Oak Ridge Lodge, Mt. Airy Forest. Unfortunately, vacations prevented many members from attending a most successful affair. It featured a tense and exciting ball game between two teams captained by the brothers George and Bob Willett. The nip-and-tuck six-inning pitchers' battle, enlivened by tight pitching, spectacular fielding, and hard hitting, saw brother George's team emerge victorious by the close score of 18–16.

A fine meal was then served, after which the group enjoyed horseshoe pitching, shuffleboard, and cards. That the picnic was a success was attributable to the fine work by George and Bob Willett and to CARL CLAYBAUGH who took care of all arrangements.

It was with considerable regret that the Branch learned of the passing on July 19, of THOMAS P. MCHUGH, a long-time member who had lately been prevented from taking active part by the illness which finally claimed his life. He leaves a host of friends and admirers in the plating industry.

CHARLES WISE, *Secretary*

MELBOURNE BRANCH

A record number of seventy-five members and visitors attended the 52nd regular meeting of the Branch on May 24, which took the form of a plant visit to the Commonwealth Aircraft Corporation, Fishermen's Bend.

Parties were first shown the large, modern and well-equipped plant, the work of which included overhaul of Wirraway Trainers and assembly of Mustang Fighters, mostly from parts made on the spot. Highlight of the inspection, however, was the manufacture of Nene jet engines. The party was later taken to the electroplating section, also most impressive in size and equipment. Among the interesting exhibits on display were silver plated knuckle pins and bearings and examples of heavy nickel and chromium coatings used in the production of jet engines and for building up worn parts of piston engines.

After welcome refreshments, VICE-PRESIDENT BOB TAYLOR moved a vote of thanks to the company and the guides who had so effectively dealt with the large attendance. He also expressed the best wishes of the Branch to SECRETARY JOHN DALE and the hope that he have a pleasant and profitable trip to America.

ROWLAND H. KELLER,
Hon. Assistant Secretary

MELBOURNE BRANCH

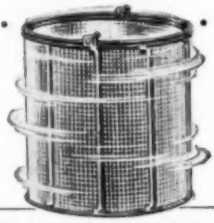
Thirty-one members and visitors were present at the 54th regular meeting on Thursday, July 20.

HUGH TEAGUE introduced B. JOHNSTON, a member of the Melbourne Branch, who spoke about "Copper Plating with the Pyrophosphate Solution". Mr. Johnston outlined the copper plating process at his factory, illustrating his talk with Hull-cell-plated samples. Costs, operating conditions, methods of analysis, and advantages and disadvantages of the solution were discussed, it being pointed out that smooth, thick deposits could readily be obtained.

PAYS FOR ITSELF... IN TIME SAVED

Kreider Dryer with auxiliary steam heating unit (illustrated). Auxiliary natural gas heating unit available; also standard model without auxiliary heating.

Basket (below). Heavy gauge woven steel mesh over steel frame. Capacity, 1140 cu. ins.



Spin-Dries* up to 50 pounds in less than 2 minutes

Saves drying time. Kreider Dryer operates on ¾ h.p. at 625 r.p.m. . . . cuts drying time to as little as 35 secs.—no more than 2 mins.—for each 50 lbs.

Saves production time. Runs at top speed with maximum load, hour after hour, day after day. Ends drying "bottle necks". . . assures smooth, evenly dried surfaces, longer lasting lustre—fewer "rejects."

Saves maintenance time. Simple, sturdy construction reduces "time-outs" for repairs and servicing to a minimum. Assures long life.

See for yourself! Write Department PL 90 today for illustrated 4-page folder . . . also addresses of installations near you.

New Holland Machine Co., New Holland, Pa.

***Only 2 simple steps required...**

(1) Operator places wire mesh basketful of small parts in Dryer . . . turns motor "ON."

(2) Operator turns motor "OFF" . . . presses foot brake . . . removes basket.

NEW HOLLAND *KREIDER* DRYER

The speaker's knowledge of his subject was particularly apparent when being questioned by the meeting at the conclusion of his address.

ROWLAND H. KELLER,
Hon. Assistant Secretary

NEW YORK BRANCH

The Branch met for a business meeting on June 9. Five new applicants for membership were considered. The delegates were then instructed to seek the 1953 Convention for New York.

After a brief question and answer period, conducted by LIBRARIAN D. HARTSHORN, the meeting was adjourned.

GRACE ARONSON,
Recording Secretary

NEW YORK BRANCH

On June 23, the scheduled speaker, DR. A. KENNETH GRAHAM, who was to speak about "Brass Plating", was unable to attend because of illness. Instead, an open forum on the subject was held, and in answering questions from the floor, several members gave impromptu talks.

Reports of the Boston Convention were given by GEORGE HERRMAN, GEORGE SCHORE, FRANKLIN MACSTOKER, ALEXANDER BRAUN, and MILTON NADEL, after which MR. LOUIS GAGNON, Ex-President of the Boston Branch, who happened to be present, summed up the reports and enlarged upon them.

After the meeting had adjourned, refreshments were served.

GRACE ARONSON,
Recording Secretary

PHILADELPHIA BRANCH

At the dinner meeting in Mosebach's restaurant on June 23, attended by about forty members and guests, the featured speaker was MR. HOWARD J. MCALEER, President of the Formax Manufacturing Company. His topic was "Practical Facts on Polishing and Buffing Compounds and Wheels", and practical facts were exactly what Mr. McAleer gave. His talk, although lengthy, was a completely engrossing description of what goes into polishing and buffing compounds, why they are used, where they are best used, how to tell the relative qualities of compounds intended for the same use. Mr. McAleer then gave a complete description of the manufacture of buffs. Starting with the cloth, he proceeded with the various basic types of buffs (full disc, piece and bias), how and why they are made, how to tell quality, and where they are used to best advantage.

Mr. McAleer's talk was one of the best practical reviews that this writer has had the privilege of hearing, and as one "old timer" expressed himself, "I've been polishing longer than most of these fellows are old, and this is the first time I have ever heard such real, first-class information about the materials I have been using".

TOM RODGERS, Chairman of the "Philadelphia in '53" Committee, reported that the Convention had chosen Philadelphia for the National Convention in 1953 and cited the help given by the Philadelphia Convention Bureau and Hotel Benjamin Franklin. The committee was discharged with a rising vote of thanks.

The Secretary reported on the business activities of the Boston Convention and PRESIDENT HEIMAN gave a resume of the technical papers. An extremely spirited discussion interspersed his reports, in which all who were at the Convention and heard the papers took part.

The door prize, a screen-door latch and knocker donated by Skillman Hardware Manufacturing Company through EUGENE ZURBACH, was won by PAUL MENTZER.

I. WM. MARCOVITCH, Secretary

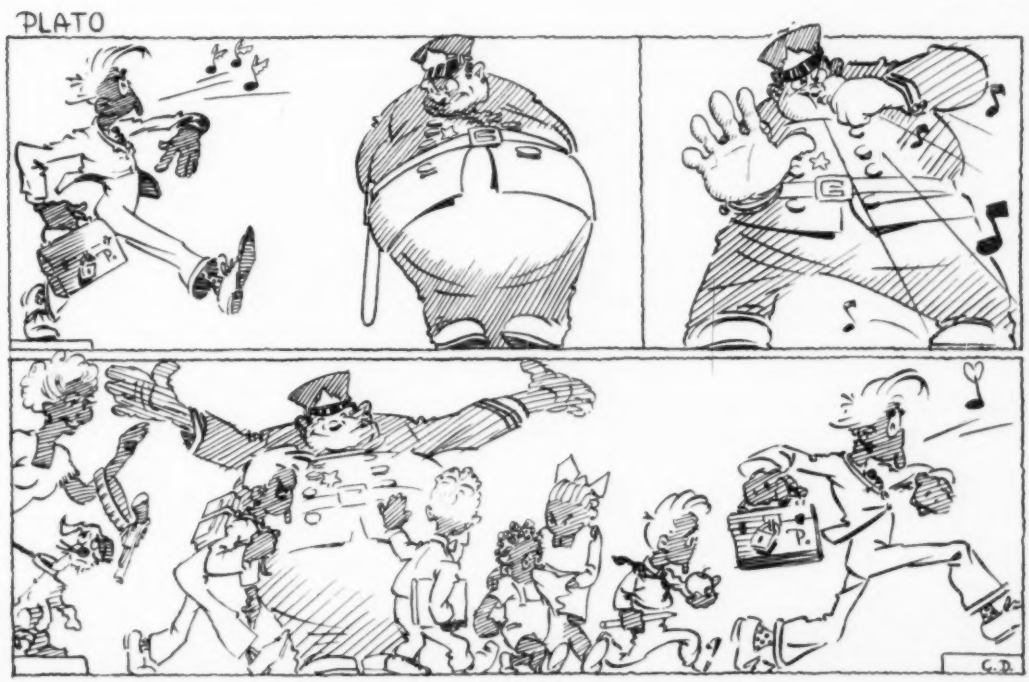
SYRACUSE BRANCH

Syracuse Branch closed its activities until Fall at the Annual Dinner, held this year in Bersani's Restaurant on June 23.

The attendance was thirty-one. Three new members were elected. Dinner was excellent, and the entertainment was motion pictures shown by MR. S. GOODMAN of Allegheny Ludlum Corporation.

The refreshments, dinner, entertainment, and fellowship was enjoyed by all.

K. S. PARNELL, Acting Secretary



Membership Report of the A. E. S.

Elections

ADELAIDE BRANCH: R. H. Hall, W. H. Ledgard

ALLENTOWN – READING BRANCH: Fred W. Fleischmann

BALTIMORE - WASHINGTON BRANCH. Russell Borichevsky, G. Edward Murray

CHICAGO BRANCH: W. Harrell Burge, Joseph J. Fitzsimmons, Claude T. Musgrave, Irvin E. Olson, Robert A. Paulsen, L. B. Rosendahl, Edward O. Stanek, Arno L. Weller, James Zacharias

HAMILTON BRANCH: F. Thomas

INDIANAPOLIS BRANCH: Harold J. LaCasse

MELBOURNE BRANCH: G. M. Carter, J. Della-Pietra

ROCKFORD BRANCH: Robert H. Campbell, Charles L. Hendricks, Elmer R. Johnson, Milton O. Johnson, Herbert Knop, Lewis Maffioli, Harry E. Matthews, Arnold A. Westfall, Edward J. Williams

SAN FRANCISCO BRANCH: B. D. Logan, Edward J. Moon, Joseph H. Strasser, C. W. Sullins, Louis C. Tompkins

TORONTO BRANCH: G. C. MacDonald, S. J. Majka, William Miller, A. Ross Moores, William Vint, R. Warner

MEMBERSHIP-AT-LARGE: W. A. O. Bilger, A. Hoch, Marius S. Gosse, Jules Odekerken

Reinstatements

INDIANAPOLIS BRANCH: Sherman Long

Transfers

Bernard Agruss from Detroit Branch; Gilbert Cummins from Lancaster Branch; L. S. Larkin from Toronto Branch to Membership-at-Large; D. R. Mainland from Toronto Branch

Resignations

BALTIMORE - WASHINGTON BRANCH: A. H. Brookes, Irvin H. Hahn

CHICAGO BRANCH: Leonard A. Friesendahl

DETROIT BRANCH: Graham K. Philp, Earl F. Soop

INDIANAPOLIS BRANCH: Thomas O'Nan

LOS ANGELES BRANCH: John F. Drake, Gladys Hedeen, H. L. Preston

TORONTO BRANCH: J. A. Heslin, W. A. Trott

Membership Competition

BRANCH	Membership April 1, 1950*	New Members	Net Change in Membership	Per Cent Net Change
FIRST GROUP				
GRAND RAPIDS	141	6	+17½	+12.4
CLEVELAND	195	18	+15½	+ 7.9
BOSTON	142	7	+ 9	+ 6.3
CHICAGO	372	17	+16	+ 4.3
DETROIT†	483	23	+20½	+ 4.2
TORONTO	124	6	+ 3	+ 2.4
HARTFORD	132	3	+ 2½	+ 1.9
NEW YORK	280	3	+ 4	+ 1.4
PITTSBURGH	142	1	+ 1½	+ 1.1
MILWAUKEE	124	2	+ 1	+ 0.8
LOS ANGELES	201	7	− 1	− 0.5
BRIDGEPORT	155	4	− 1	− 0.6
NEWARK	238	1	− 3	− 1.3
PHILADELPHIA	192	4	− 3	− 1.6
WATERBURY	125	..	− 2	− 1.6
SECOND GROUP				
MELBOURNE†	111	9	+ 8½	+ 7.7
MONTREAL	68	6	+ 5	+ 7.4
ROCHESTER	104	4	+ 4	+ 3.8
CINCINNATI	87	3	+ 3	+ 3.4
BALTIMORE-WASH.	85	2	.....	.....
ST. LOUIS	97	2	.....	.....
TWIN CITY	71	..	.....	.....
NEW HAVEN	106	..	− ½	− 0.5
INDIANAPOLIS	94	3	− 2	− 2.1
DAYTON	93	..	− 5½	− 5.9
PROV.-ATTLEBORO	112	3	− 8	− 7.1
ADELAIDE	72	4	− 6	− 8.3
SYRACUSE	85	5	−11	−12.9
SYDNEY	109	4	−19	−17.4
THIRD GROUP				
ROCKFORD	64	9	+ 9	+14.1
COLUMBUS	47	3	+ 4½	+ 9.6
ST. JOSEPH VALLEY	66	6	+ 6	+ 9.1
ALLENTOWN-READING	37	4	+ 3	+ 8.1
SAN FRANCISCO	66	5	+ 5	+ 7.6
HAMILTON	23	1	+ 1	+ 4.3
TOLEDO	49	2	+ 2	+ 4.1
SPRINGFIELD	51	1	+ 1	+ 2.0
WESTERN ONTARIO	23	..	.....	.....
JACKSON-LANSING	57	..	− 1	− 1.8
SAGINAW VALLEY	64	..	− 2	− 3.1
SOUTHEASTERN†	54	..	− 4	− 7.4
LANCASTER	62	..	− 6	− 9.7
LOUISVILLE	25	..	− 5½	−22.0
OUTSIDE COMPETITION				
AT LARGE	104	17	+17	.....
IN TRANSFER	27	..	− 1	.....
TOTAL A. E. S.	5,236	199	+82	+ 1.5

Active Membership, August 1, 1950 5,318

*Subject to Correction. †Winners of membership competition in 1949–1950.

WATERBURY BRANCH: Clarence E. McKinney

INDIANAPOLIS BRANCH: Thomas Adams, Harry J. Green, James J. Monagle, George M. Osman, Julian G. Sparkes

LANCASTER BRANCH: William C. Bauer, William J. Corby, Thomas J. Keller

SYDNEY BRANCH: J. M. Adams, J. V. McAuliffe, P. G. Phipps, L. A. Storey, E. D. Terry, Patrick Evans

TORONTO BRANCH: C. S. Mason, A. J. Johnson, J. C. Wilson

WATERBURY BRANCH: Lawrence D. Hooper

Deaths

BRIDGEPORT BRANCH: Thomas Barnes, Jr.

CHICAGO BRANCH: C. Fowler

CINCINNATI BRANCH: T. P. McHugh

DAYTON BRANCH: Robert G. Suman

SYDNEY BRANCH: R. G. Pope

SYRACUSE BRANCH: George Kushner

Suspensions

ADELAIDE BRANCH: A. L. Fisher, F. C. Fuss, Hughie Hogg, G. Hughes, G. Lidstone, J. L. Munro, B. Quist, C. A. Schutte, J. B. Smith, L. Stacco

ALLENTOWN - READING BRANCH: R. G. Humphrey

The Mailbox

(*Continued from page 928*)

reaction with the 1-amino-2-naphthol-4-sulfonic acid reagent produced by the phosphate radical. On standing in the water solution, however, the pyrophosphate slowly hydrolyzes back to phosphate, and the blue color gradually appears. It is easy to avoid the formation of pyrophosphate by taking the sample for the phosphate analysis from the original plating solution instead of from that portion which had been prepared for the gold analysis.

Step E-1 should therefore read: "Pipette a 2-ml sample of plating solution into a 100-ml volumetric flask, dilute to the mark with distilled water, shake well, and with another dry pipette take 5 ml from this diluted sample into another 100-ml volumetric flask". The time in step E-5 has to be standardized and kept within 10–20 minutes.

The calibration chart, of course, also has to be prepared using the same procedure, which will be found very satisfactory.

Sincerely yours,
KARL NELL

Briefs on barrel finishing

Technical Service Department
WYANDOTTE CHEMICALS CORPORATION

Summary: *Barrel finishing offers manufacturers an economical method of finishing small parts in bulk. Steel balls or shapes produce a smooth lustrous finish. Stones remove excess metal, as well. Improvements in technique are widening the field.*

Barrel finishing consists of rotating the work in a barrel together with a burnishing medium and a solution of the burnishing compound. The parts are handled in large quantities and the labor cost per part is low.

The method is especially suited to very small parts. The work is easier to clean than buffed work. It is possible to form definite radii and micro-inch surface finishes. It can produce mirror finishes.

Two media are used: steel balls or stones. Steel balls are used to produce a smooth lustrous finish. They remove almost no metal. Rather, they "iron out" the surface by the rolling and sliding burnishing shapes. Stones, on the other hand, remove excess metal in addition to producing a smooth finish.

The burnishing compound serves as a lubricant between the parts and the burnishing medium and between the parts themselves. In this manner, a smooth finish is obtained, whereas, in its absence, seizure and scratching are easily possible.

Often, the burnishing compound contains a brightening agent to remove metal oxides and yield a true metallic color. Lastly, the burnishing compound should have sufficient detergent action to remove traces of oil and other contaminants from the parts.

The burnishing compound should be selected with care. It should suit both the work and the media. Wyandotte products for this use include: Light Alloy No. 1 Cleaner, Burnishing Compounds 317, 321 and 322, Burnishing Powder and Neosuds*.

By far the greater percentage of small parts can be finished in a barrel with few problems. As the parts become larger and more complex the difficulties do increase. But with ingenuity more and more types of work now considered too difficult or uneconomical will yield to improved techniques of barrel finishing. If you have a problem write us.

*Reg. U. S. Pat. Off.

THE WYANDOTTE LINE — products for burnishing and burring, vat, electro, steam gun, washing machine and emulsion cleaning (soak or washing machine), acid pickling, related surface treatments and spray booth compounds. An all-purpose floor absorbent: Zorball — in fact, specialized products for every cleaning need.

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plating

September 1, 1950

Dear Reader:

With military requirements steeply increased because of the Korean war and the rearming of Europe, American industry is again faced with material shortages.

So far as the plater is concerned, he is encountering a tight supply of almost every metal and chemical. Nickel and cadmium anodes and salts are under seller allocation, tin anodes and salts have risen sharply in price. All in all, the plater is beginning to find himself in the same position as in 1941.

We would undoubtedly experience a severe contraction of manufacturing for civilian needs, with accompanying decrease of supply requirements, if the present war spreads. That, however, is by no means certain. Instead we may remain for a long time in the present in-between situation, with the plater expected to manage with what he can get.

A great many tricks were devised during the last war to conserve material, and their use certainly should be revived now. There is also need for careful examination of what has been learnt since then. Waste-disposal control has pointed the way to substantial reduction in waste losses. Considerable light has been shed on the protective value of plated coatings through A.S.T.M. exposure tests (in the 1950 report of Committee B-8), A.E.S. porosity research (see Dr. Wesley's article in this issue), and New Jersey Zinc Company's micro-throwing-power studies (to appear in A.E.S. Proceedings of this year).

Careful management may yet see the plating industry through the difficult times ahead.

Sincerely,

Gustaf Soderberg

Future Meetings

NATIONAL CHEMICAL EXPOSITION, in Coliseum, Chicogo, Ill., on September 5-9.

FIFTH NATIONAL INSTRUMENT CONFERENCE AND EXHIBIT in Memorial Auditorium, Buffalo, N. Y., on September 18–22.

ELECTRODEPOSITORS' TECHNICAL SOCIETY AND DUTCH ELECTROPLATERS' SOCIETY Joint Meeting in The Hague, Scheveningen, Holland, on September 27–30.

COMMITTEE B-8 ON ELECTRODEPOSITED METALLIC COATINGS, A. S. T. M. in Hotel Statler, Buffalo, N. Y. Working Sections, October 9, P. M., and October 10, A. M.; Subcommittees October 10, P. M., and October 11, A. M.; Main Committee, October 11, P. M.

THE ELECTROCHEMICAL SOCIETY 98th Meeting in Hotel Statler, Buffalo, N. Y., on October 11–14.

THIRTY-EIGHTH NATIONAL SAFETY CONGRESS AND EXPOSITION OF THE NATIONAL SAFETY COUNCIL, Chicago, Ill., on October 16–20.

NATIONAL METAL CONGRESS AND EXPOSITION, American Society for Metals, in International Amphitheatre, Chicago, Ill., on October 23–27.

FOURTEENTH ANNUAL NATIONAL TIME, MOTION AND MANAGEMENT CLINIC of the Industrial Management Society in Sheraton Hotel, Chicago, Ill., on November 2–3.

SECOND PLANT MAINTENANCE SHOW AND CONFERENCE in the Auditorium, Cleveland, Ohio, on January 15–18, 1951.

AMERICAN ELECTROPLATERS' SOCIETY Annual Convention in Hotel Biltmore, Los Angeles, Calif., on June 25–28, 1951.

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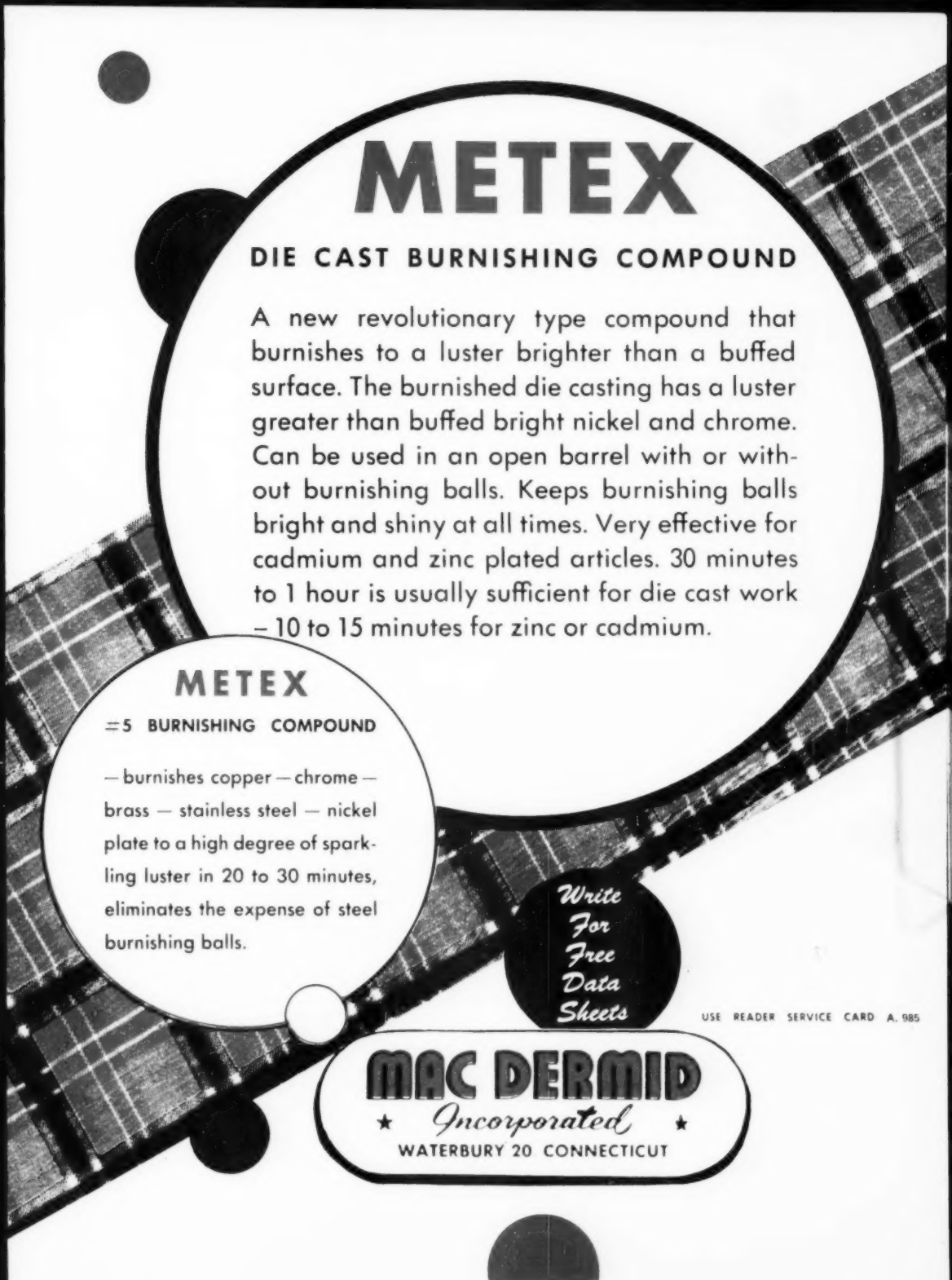
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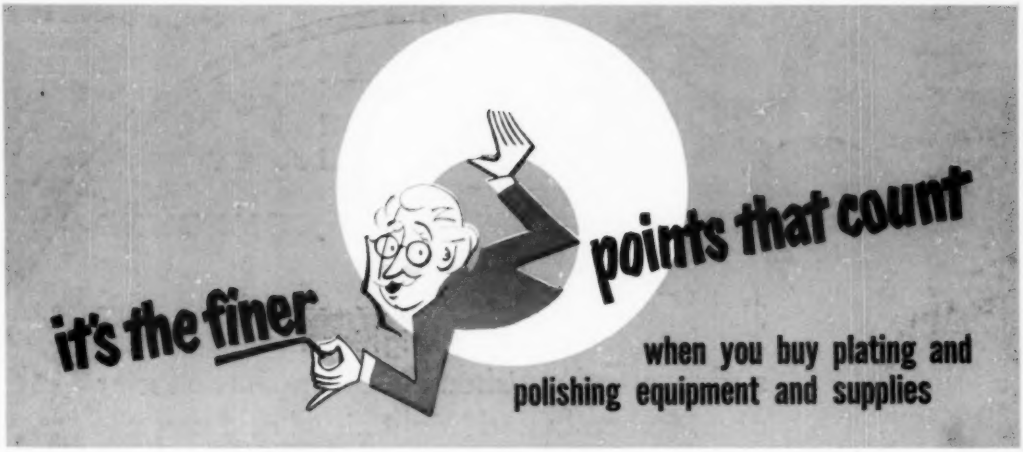

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